


Towards a Theory of Mobile Learning:
the Design of Learning Spaces for the
Higher Education Landscape

Mohamed Osman Mohamed El-Hussein

 CAPE PENINSULA
UNIVERSITY OF TECHNOLOGY
LIBRARIES

Dewey No. ARC 378.1758 MOH

CAPE PENINSULA
UNIVERSITY OF TECHNOLOGY



20126606

CPT ARC 378.1758 MOH



Cape Peninsula
University of Technology

**Towards a Theory of Mobile Learning: the Design of Learning Spaces for the
Higher Education Landscape**

by

Mohamed Osman Mohamed El-Hussein

**Thesis Submitted in Fulfilment of the Requirements for the Degree: Doctor of
Technology: (Information Technology)**

in the Faculty of Informatics and Design

at the Cape Peninsula University of Technology

Supervisor: Prof. Dr Johannes C. Cronjé

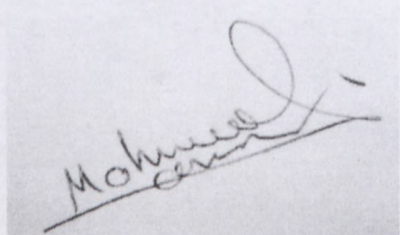
Co-supervisor: Dr Pineteh E. Angu

Cape Town

Date submitted (June, 2011)

DECLARATION

I, Mohamed Osman Mohamed El-Hussein, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

A handwritten signature in black ink, appearing to read 'Mohamed Osman Mohamed El-Hussein', written over a horizontal line.

Signed

10. 01. 2012

Date

ABSTRACT

This thesis is based on an analysis of the position of mobile learning within learning and instructional design theories in Higher Education. It seeks to understand the concept of mobile education or mobile learning, the technology of mobile learning and its interactions with other media of learning. It also aims to unlock the relationship between the learning theory and mobile learning as well as the position of mobile learning, handheld and wireless technologies at universities.

The research design, approach, methodology and methods of this study were framed around the qualitative grounded theory. This approach guided the process of collecting and analysing data as well as the discussion of key findings. The data was gleaned from personal interviews and analysis of literature. The analysis of the data focused on the social, economic, ideological and technological dynamics and the way they have shaped the complex landscape of mobile learning in higher institutions of learning. It also concentrated on the recurrent paradigm shifts and changes and their implications for teaching and learning in higher institutions.

The analysis of data uncovered several issues that are pertinent to our understanding of mobile learning. For example, it revealed that mobile learning is not about the mobile technology but rather about the learner and the learning experience, with the media playing the role of an instrument for mobilising learning and instruction. It also led us to the conception that mobile learning has the potential to promote outdoor learning. This is because this type of technology provides learners with information that they need about their learning context. Finally it was evident from data that learning was moving away from process to an institutional social phenomenon. It has acquired asocial institutional meaning in conceptions such as the learning society and organisation as well as lifelong and ubiquitous learning.

In this light, this study concludes that integrating classroom-based learning with informal mobile learning can add value to formal classroom-based learning and it can also enhance learners' overall learning experience. Moreover, although the concept of learning space is not restricted to online learning, it is likely to create new learning spaces. The project also concludes that mobile learning resonates with the learning and instructional design theories such as the associative, constructive and situated learning theory.

KEYWORDS

Mobile learning, electronic learning, learning theory, instructional design theory, behaviourism, constructivism, situated, deconstructionism, educational technology

ACKNOWLEDGEMENTS

I wish to thank:

- My research advisor Prof. Dr Johannes C. Cronje for his intellectual guidance and support throughout my research journey.
- My co-supervisor, Dr Pineteh E. Angu, for his contributions during the writing phase of this thesis.
- Dr Jill Fresen for editing the final draft of this thesis.
- The interviewees for their invaluable contributions during the interviews.
- The Department of Information Technology and Cape Peninsula University of Technology for providing me with the necessary material resources.
- The Post-Graduate Research Programme (PRP) at the Faculty of Informatics and design for its invaluable information and guidance of research process.

The financial assistance of the Cape Peninsula University of Technology (CPUT) towards this research is acknowledged. Opinions expressed in this thesis and the conclusions arrived at, are those of the author, and are not necessarily to be attributed to the CPUT.

DEDICATION

For my beloved wife,

For my mother,

For my father's soul,

For my brother,

For my sisters,

For my future children

For my students

TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
KEYWORDS.....	iv
ACKNOWLEDGEMENTS	v
DEDICATION	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	xi
LIST OF TABLES	xii
CHAPTER 1	1
INTRODUCTION	1
1.1 BACKGROUND TO THE RESEARCH PROBLEM	1
1.2 STATEMENT OF THE RESEARCH PROBLEM.....	5
1.2.1 THE TECHNOLOGY OF MOBILE LEARNING AND ITS INTERACTIONS WITH OTHER MEDIA OF LEARNING	6
1.2.2 LEARNING THEORY RELEVANT TO MOBILE LEARNING	7
1.2.3 THE POSITION OF MOBILE LEARNING, HANDHELD AND WIRELESS TECHNOLOGIES IN THE HIGHER EDUCATION LANDSCAPE	8
1.3 RESEARCH OBJECTIVES	8
1.4 RESEARCH QUESTIONS	9
1.5 RATIONALE OF THIS RESEARCH.....	10
1.6 RESEARCH METHODS.....	11
1.7 THEORETICAL RESEARCH PERSPECTIVE	11
1.8 CONSTRUCTING ARGUMENTS	13
1.9 SIGNIFICANCE OF THE STUDY	15
1.10 LIMITATIONS OF THE STUDY	16
1.11 BRIEF OVERVIEW OF THE CHAPTER.....	16
1.12 THE STRUCTURE OF THE THESIS	17
1.13 ETHICS	19
CHAPTER 2	20
LITERATURE REVIEW	20
SECTION 1	21
SIGNS OF A MOBILE LEARNING ERA: MOBILITY AS A PARADIGM SHIFT.....	21
2.1 INTRODUCTION.....	21
2.2 MOBILITY	21
2.2.1 MOBILITY OF CITIZENSHIP AND GLOBALISATION.....	21
2.2.2 MOBILITY OF PEOPLE DEMOGRAPHY	23
2.2.3 MOBILITY OF WORK AND THE ECONOMY	23
2.2.4 MOBILITY OF PRIVACY AND PUBLIC.....	24
2.2.5 MOBILITY OF INDIVIDUALISATION AND SOCIALISATION	26
2.2.6 MOBILITY OF COMMODIFICATION	28
2.2.7 MOBILITY OF POLICY INTO PRACTICE	29
2.2.8 MOBILITY OF INSTRUCTIONAL TECHNOLOGY (E-LEARNING AND M-LEARNING)	31
2.2.9 CATEGORIES OF MOBILE LEARNING	35

SECTION 2	41
THE THEORETICAL POSITION OF MOBILE LEARNING: RESONANCE TO LEARNING AND INSTRUCTIONAL DESIGN THEORIES	41
2.1 INTRODUCTION	41
2.2 TRADITIONAL CHARACTERISTICS OF LEARNING	41
2.2.1 SOCRATES (c. 470 – 399 B. C. E.).....	41
2.2.2 PLATO (c. 428 – 348 B. C. E.).....	42
2.3 MODERN CHARACTERISTICS OF LEARNING	43
2.4 CATEGORIES OF MODERN LEARNING AND INSTRUCTIONAL DESIGN THEORIES	44
2.5 THE IMPLICATIONS OF ASSOCIATIVE PARADIGMS FOR MOBILE LEARNING	48
2.5.1 IVAN PAVLOV (1849 –1936).....	49
2.5.2 EDWARD L. THORNDIKE (1874 – 1949).....	51
2.5.3 JOHN WATSON (1878 – 1958).....	53
2.5.4 B. F. SKINNER (1904 – 1990).....	53
2.5.5 ROBERT GAGNÉ (1916 – 2002).....	56
2.6 THE IMPLICATIONS OF CONSTRUCTIVIST PARADIGMS FOR MOBILE LEARNING.....	58
2.6.1 THE IMPLICATIONS OF A CONSTRUCTIVIST INDIVIDUAL APPROACH TO MOBILE LEARNING	59
2.6.1.1 <i>Jean Piaget (1896 – 1980)</i>	60
2.6.1.4 <i>Seymour Papert (1928 - *)</i>	61
2.6.1.5 <i>David A. Kolb (1939 - *)</i>	61
2.6.2 THE IMPLICATION OF THE CONSTRUCTIVIST SOCIAL APPROACH TO MOBILE LEARNING	62
2.6.2.1 <i>Lev Vygotsky (1896 – 1934)</i>	62
2.6.2.2 <i>Richard Mayer</i>	63
2.6.2.4 <i>David Jonassen</i>	64
2.7 THE IMPLICATIONS OF SITUATED PARADIGMS FOR MOBILE LEARNING.....	65
2.7.1 JEAN LAVE AND ETIENNE WENGER (COMMUNITIES OF PRACTICE).....	66
2.7.2 COLE, ENGELSTRÖM AND WERTSCH (ACTIVITY THEORY).....	67
2.8 CONCLUSION	68
CHAPTER 3	72
CONCEPTUAL FRAMEWORK	72
DEFINING MOBILE LEARNING IN THE HIGHER EDUCATION LANDSCAPE	73
3.1 INTRODUCTION	73
3.2 RESEARCH METHOD	74
3.3 A CONCEPTUALISATION OF MOBILE LEARNING	76
3.4 MOBILE LEARNING IN HIGHER EDUCATION	80
3.5 THE DEFINITION	81
3.5.1 MOBILITY OF TECHNOLOGY	82
3.5.2 MOBILITY OF LEARNERS	84
3.5.3 MOBILITY OF LEARNING	85
3.7 CONCLUSIONS	88
CHAPTER 4	89
RESEARCH DESIGN AND APPROACH	89
4.1 INTRODUCTION	89
4.2 RESEARCH ASSUMPTIONS	89
4.3 QUALITATIVE RESEARCH AS A DESIGN CHOICE	92
4.4 GROUNDED THEORY AS A RESEARCH APPROACH	93
4.5 DATA COLLECTION: PROCEDURES AND TECHNIQUES	96

4.6	THE RESEARCH MATRIX.....	98
4.7	RESEARCH METHODS.....	98
4.7.1	LITERATURE AND DOCUMENTS	99
4.7.2	INTERVIEWS.....	105
4.8	DATA ANALYSIS	107
4.8.1	THEMATIC CONCEPTS AND DOCUMENT ANALYSIS	108
4.9	VALIDITY AND RELIABILITY OF DATA	109
3.9.1	VALIDITY	109
4.9.2	RELIABILITY	110
4.10	ETHICAL CONSIDERATIONS	110
4.11	CONCLUSIONS	112
	CHAPTER 5	113
	DISCUSSION OF FINDINGS: THE SIGNS OF MOBILE LEARNING DEVELOPMENT	113
	SECTION 1.....	115
	IMPLICATIONS OF THE MOBILITY OF TECHNOLOGY	115
5.1.1	INTRODUCTION.....	115
5.1.2	MOBILITY OF TECHNOLOGY: USE AND USABILITY	117
5.1.3	MOBILITY OF TECHNOLOGY: MANAGEMENT	122
5.1.4	MOBILITY OF TECHNOLOGY: PEDAGOGICAL APPROACHES	126
5.1.5	MOBILITY OF TECHNOLOGY: TECHNICAL SUPPORT	128
5.1.6	MOBILITY OF TECHNOLOGY: LEARNER MOTIVATION	131
5.1.7	MOBILITY OF TECHNOLOGY: STAYING ONLINE	133
5.1.8	MOBILITY OF TECHNOLOGY: THE DISAFFECTED LEARNER.....	136
5.1.9	MOBILITY OF TECHNOLOGY: INSTRUCTIONAL DESIGN	138
	SECTION 2.....	141
	IMPLICATIONS OF THE MOBILITY OF LEARNERS	141
5.2.1	INTRODUCTION.....	141
5.2.2	MOBILE LEARNERS' EXPERIENCES	143
5.2.3	HOW DO MOBILE LEARNERS LEARN?.....	146
5.2.4	ATTITUDES OF MOBILE LEARNERS.....	148
5.2.5	STRATEGIES OF MOBILE LEARNERS.....	150
5.2.6	EMPOWERING MOBILE LEARNERS	151
	SECTION 3.....	156
	IMPLICATIONS OF THE MOBILITY OF LEARNING	156
5.3.1	INTRODUCTION.....	156
5.3.2	MOBILITY OF LEARNING VERSUS TEACHING	158
5.3.3	MOBILITY OF LEARNING METHODS.....	160
5.3.4	MOBILITY OF LEARNING AND CLASSROOM LEARNING	161
5.3.5	MOBILITY OF LEARNING FACILITATION	163
5.3.6	MOBILITY OF LEARNING ACTIVITIES.....	165
5.3.7	MOBILITY OF LEARNING OUTDOORS.....	167

5.3.8	MOBILITY OF LEARNING SHIFTING BETWEEN FORMAL AND INFORMAL LEARNING	169
5.3.9	MOBILITY OF LEARNING AND MOBILE MASS MEDIA TECHNOLOGIES	171
5.3.10	MOBILITY OF LEARNING AND MASS MEDIA CONTROLS.....	174
5.3.11	MOBILITY OF LEARNING: SOCIAL SIGNS.....	178
5.4	CONCLUSION.....	179
CHAPTER 6		184
CONCLUSIONS AND RECOMMENDATIONS		184
6.1	INTRODUCTION.....	184
6.2	SUMMARY	185
6.3	DISCUSSION	187
6.3.1	METHODOLOGICAL REFLECTION	187
6.3.1.1	<i>Literature and document reflection</i>	188
6.3.1.2	<i>Interview reflection</i>	189
6.3.1.3	<i>Analysis reflection</i>	189
6.3.2	SUBSTANTIVE REFLECTION.....	190
6.3.3	SCIENTIFIC REFLECTION.....	191
6.3.3.1	<i>Mobility of technology</i>	194
6.3.3.2	<i>Mobility of learners</i>	195
6.3.3.3	<i>Mobility of learning</i>	196
6.4	RECOMMENDATIONS	196
6.4.1	POLICY AND PRACTICE	197
6.4.2	FURTHER RESEARCH.....	198
6.4.3	FURTHER DEVELOPMENTS	200
REFERENCES		201
APPENDICES		212
APPENDIX A: ETHICAL CLEARANCE		213
APPENDIX B: INTERVIEWS TIMETABLE		215
APPENDIX C: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 1)		215
APPENDIX D: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 2)		216
APPENDIX E: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 3).....		217
APPENDIX F: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 4).....		218
APPENDIX G: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 5)		220
APPENDIX H: A CERTIFICATE OF LANGUAGE EDITING		221

LIST OF FIGURES

FIGURE 2.1: TRADITIONAL CHARACTERISTICS OF LEARNING.....	41
FIGURE 2.2: LEARNING AND INSTRUCTIONAL DESIGN THEORISTS.....	47
FIGURE 2.3: TECHNOLOGY SELECTION (ADAPTED FROM ATTWELL, 2005:3).....	54
FIGURE 2.4: THE STRUCTURE OF HUMAN ACTIVITY SYSTEM.....	67
FIGURE 3.5: THE THREE CONCEPTS OF MOBILE LEARNING.....	82
FIGURE 3.6: PDA TECHNOLOGY	83
FIGURE 4.7: FOUR PARADIGMS FOR ANALYSIS OF SOCIAL THEORY.....	90
FIGURE 8: THE GROUNDED THEORY PROCESS.....	95
FIGURE: 4.9: THE GROUNDED THEORY 'DATA DANCE'.....	97

LIST OF TABLES

TABLE 1: DEFINITIONS AND EXPLANATIONS OF TERMS, ACRONYMS AND ABBREVIATIONS	XIII
TABLE 1.2: THE STRUCTURE OF THE THESIS.....	18
TABLE 2.3: TERMINOLOGY COMPARISON BETWEEN E-LEARNING AND M-LEARNING (ADAPTED FROM COBCROFT, 2006:14).....	34
TABLE 2.4: KEY MARKERS THAT DISTINGUISH INDUSTRIAL-AGE AND INFORMATION-AGE ORGANISATIONS (ADAPTED FROM REIGELUTH, 1996:17)	39
TABLE 2.5: THREE CATEGORISES OF LEARNING THEORIES (BASED LOOSELY ON MAYES AND DE FREITAS (2004B).....	45
TABLE 2.6: STIMULUS AND RESPONSE ITEMS OF PAVLOV'S EXPERIMENTS.....	50
TABLE 2.7: PIAGET'S STAGES OF COGNITIVE DEVELOPMENT.....	60
TABLE 3.8: RESULTS OF A WEB SEARCH TO FIND THE MOST IMPORTANT RESOURCES ON MOBILE LEARNING...	75
TABLE 3.9: CONVERGENCE BETWEEN LEARNING AND TECHNOLOGY	87
TABLE: 4.10 THE RESEARCH MATRIX	98
TABLE 4.11: SAMPLE OF RESULTS OF WEB SEARCHES TO FIND THE MOST IMPORTANT JOURNALS DEALING WITH MOBILE LEARNING.....	100
TABLE 4.12: RESULTS OF WEB SEARCHES WHEN LOOKING AT CONFERENCES ON MOBILE LEARNING	101
TABLE 4.13: EXAMPLE OF SELECTING LITERATURE ANALYSIS SOURCES ACCORDING TO THE JOURNAL IMPACT FACTOR.....	104
TABLE 5.14: CONCEPTUALISATIONS OF MOBILITY OF TECHNOLOGY, LEARNERS AND LEARNING (ADOPTED FROM EL-HUSSEIN & CRONJE, 2010:12-21).....	114
TABLE 5.15: PHYSICAL FEATURES OF MOBILE DEVICES.....	116
TABLE 5.16: THE MOBILE DEVICE-USABILITY INTERSECTION.....	118
TABLE 5.17: LEARNER ASPECT.....	142
TABLE 5.18: THE MOBILE LEARNING PROCESS.....	157
TABLE 5.19: MOBILITY OF LEARNING.....	161
TABLE 5.20: THE SOCIAL ASPECT.....	178

GLOSSARY

Table 1: Definitions and explanations of terms, Acronyms and abbreviations

ADSL.....	Asynchronous (or Asymmetric) Digital Subscriber Line
ANT.....	Actor Network Theory
AT.....	Activity Theory
Blackberry.....	BlackBerry functions as a personal digital assistant with address book, calendar and to-do list capabilities. It also functions as a portable media player with support for music and video playback and camera picture and video capabilities.
CAL.....	Computer-Assisted Learning
CBL.....	Computer-Based Learning
CD.....	Compact Disc
CIE.....	Computer-Integrated Education
DVD.....	A high-density videodisc that stores large amounts of data, esp. high-resolution audio-visual material.
E-learning.....	Electronic Learning
GPS.....	Global Positioning System, an accurate worldwide navigational and surveying facility based on the reception of signals from an array of orbiting satellites.
GT.....	Grounded Theory
IAMLEARN.....	International Association of Mobile Learning
ICT.....	Information and Communication Technologies
iPhone	A combination mobile phone, multimedia player, and wireless Internet device from Apple Inc. Instead of a physical keyboard or keypad, the iPhone includes a touch-screen and virtual keyboard and buttons.
iPod.....	A line of portable music players from Apple Inc. iPod players range in size from the iPod shuffle player to iPod players that support video playback. iPod players can import music from Apple's iTunes Store and from CDs. They are designed to work with iTunes, an application available on both Macintosh and Windows computers.
LMS.....	Learning Management System
M-learning.....	Mobile Learning
MMS.....	Multimedia Message Service
MobilED.....	The MobilED – mobile audio wiki – South African mobile

learning project was a research project was started in 2006.

N-Gage.....	N-Gage is a mobile telephone and handheld game system
Nokia.....	Nokia is the world's leading mobile phone supplier and a leading supplier of mobile and fixed telecom networks including related customer services
PC.....	Personal Computer
PDA.....	Personal Digital Assistance
RAFT.....	Remote Accessible Field Trips
SMS.....	Short Message Services
SUST.....	Sudan University of Science and Technology
TEL.....	Technology-Enhanced Learning
TV.....	Television
UP.....	University of Pretoria
VR.....	Virtual Reality
WBL.....	Web-Based Learning
WebCT.....	(Course Tools) or Blackboard Learning System
Wi-Fi.....	Wireless Fidelity, a group of technical standards enabling the transmission of data over wireless networks.
WWW.....	World Wide Web

CHAPTER 1

INTRODUCTION

1.1 Background to the research problem

This thesis is about the multidisciplinary phenomena of mobility, technology, learners and learning. It aims to explore the theoretical position of mobile learning in the context of learning and instructional design theories in the Higher Education landscape. This research is centred on the relationship between the use of mobile devices and current theories of learning and instructional design that are available. Never in the history of educational technology, instructional technology and e-education have there been technologies as available and widely used as the mobile and wireless technologies that are contributing to the growth of Information and Communication Technologies (ICTs) in Higher Education today. Learners and stakeholders in Higher Education communities are not far from these technologies. Hence, mobile technologies are becoming mediating tools for teaching and learning purposes. But there is no theory comprehensive enough for it. Rather, the way mobile learning is theorised and represented depends largely on the specific dynamics of each learning community. For example, the understanding and the application of mobile technology for learning purposes is likely to be different in countries where technology is still at developing stage (Martin & Madigan 2006; Traxler, 2007).

This thesis is sculpted around the conceptual claim that wireless technology and the evolution of mobile, handheld, and portable devices have resulted in “radically new kinds of computers of all sizes and shapes to be available to each person. I call this future world ‘Ubiquitous Computing’” (Weiser, 1993:1) for the social and economic lifestyles of people as at 2010. Since more and more forms of technology are being presented in portable form, people have become accustomed to a variety of mobile technologies that affect their daily lives and their functionality. To date the information transmitted by means of mobile technology has been confined mainly to social and, to a lesser extent, economic communication. Most educators do not regard mobile learning as a core activity in the presentation of Higher Education teaching and learning, although it is often used as a minor adjunct to such activities. But Sharples Taylor and Vavoula (2007:1) contend that there is a need to “re-conceptualise learning for the mobile age, in order to recognise the essential role of mobility and communication in the process of learning”. There might be a continuous interrogation of mobile technologies and how they can be brought to bear on teaching and learning

in different communities (Trinder, 2005; Roode, 2008; Hanseth & Lyytinen, 2010). One interest of this study is to interrogate the multiple contentions about mobile learning.

The mobile devices or cellular telephones as Personal Digital Assistance (PDA) depend on their ability to function as portable and wireless telephones and video and sound recorders, and to relay text information. This popularity also stems from their ability to function as digital cameras, to save data and contact lists, to make numerical calculations, to store and play back pre-selected music in MP3 format, to create and send e-mails, to access and search the Internet, to allow users to read whatever books are currently available in e-book format, to play electronic games, and to watch videos on a media player (Trinder, 2005:7-10).

As a result of intense commercial competition between the manufacturers of mobile cellular telephones, designers constantly create and introduce new features to gain a competitive edge in the marketplace. However, these features also increase the number of ways in which users can fulfil their social and other needs. The innumerable personal computers (PCs) that now fill computer laboratories will eventually become less and less relevant as comparable features on mobile devices replace various aspects of their functionality. In this light, "new functionalities {applicable} only be added when [they are] truly needed so that the proposed capability will have enough users willing to cover the extra cost of design and learning" (Hanseth & Lyytinen, 2010:13).

Considering the two aspects of mobile learning – mobility and learning – it would be wise for educators who are planning for the future to consider that, sooner or later in the academic institutional environment, devices that are highly mobile and wireless rather than static and place-bound may dominate the educational landscape. In such an environment, context, content, and services will be relayed to Higher Education students by personal wireless mobile devices that may make the PC-based model of teaching and learning obsolete. New modes of learning will take place in conditions that will be radically different from those in past centuries (Snowden, 2002:18). Although Snowden warns us of the unprecedented changes that will accompany the eruption of wireless technologies in schools, these changes will not occur at the same pace globally. How these technologies reshape learning spaces depend largely on the configurations of each learning community, the mindsets of learners and educators (Traxler, 2009; Wishart, 2009).

According to Alexander (2004:5) mobile technology has the ability to transform teaching and learning in Higher Education. This is because technologically-mediated teaching is becoming a more and more acceptable practice among education providers who are technologically inclined. These technologies have the capacity to relay content in the form of text, photographs, audio, and video clips and multimedia in complex ways. They are also able to transmit information in a way that may conform to certain minimum standards of clarity, visibility, continuity and speed.

It is futile to pretend that mobile devices can be used for the transmission of Higher Education content in places where the connectivity is as poor as it is in many parts of Africa, for example, or where it does not exist at all. The viability of mobile devices for providing higher education to students depends on the sophistication and reliability of the Internet infrastructure in the country in which it is used. Developing countries such as those on the African continent reputedly have the most expensive telephony costs in the world; a situation no doubt attributable to the arrangement of the World Wide Web (WWW) particularly where the wireless platforms of sole government service providers have enjoyed monopolies for many years. Until some African governments commit to the provision of high-speed Asynchronous (or Asymmetric) Digital Subscriber Lines (ADSL), the use of the Internet in education will be hampered by erratic connectivity and slow connection speeds. Since mobile devices do not depend directly on data transmitted along government-owned telephone lines, they are, more viable as instruments for the transmission of data and content to students, even though such transmission can be hampered in various ways by the physical limitations and format of the mobile devices that are used. In the African context, the notion of timelessness and physical limitless associated with mobile technology is untenable because many learners still rely on university computer laboratories for the Internet access.

To this end, a section of this thesis provides a comprehensive definition of mobile learning from the point of view of educational practice and purposes. Here, the question addressed is 'how are actual mobile learning practices changing socially in Higher Education?' In order to find acceptable answers to this question, it will be necessary to unpack the individual components of mobile learning and to reflect on the relatively recent impact of the increasing mobility of learners, learning, and learner technology. This mobility is a relatively new development in 'Western' education and it has profound implications for educational theory and a proper understanding of the dynamics of teaching and learning, especially where they depend largely on the use of mobile communication devices.

The emergence of really revolutionary technologies has had a major effect on the field of educational technology and they have increased the potential inherent in e-learning as a style of education. Mobile learning (m-learning) is, learning by means of wireless technological devices that can be kept in a person's pocket and that can be utilised wherever the learner's device is able to receive unbroken signals from one of the transmission towers on which the relevant network depends (Traxler, 2007:1). Mobile devices have the potential to change the face of Higher Education. Such changes have already been described in project and pilot reports on the practical aspects of mobile learning worldwide. Such reports can be accessed at The International Association for Mobile Learning (IAMLearn) on (<http://mlearning.noekaleidoscope.org/>).

One of the most important practical challenges that face mobile learning is how to integrate mobile devices with 'face-to-face' conversational learning and mobile learning with the requirements of Higher Education so that e-learning can take place anytime and everywhere. One of the most basic questions that needs to be answered is: why are mobile devices not yet regarded as sufficiently developed to function within the context of institutional learning (formal learning), when they work so well and efficiently in the sphere of social life (informal learning)? The basic practical and philosophical challenge is how to integrate these new portable technologies with the pedagogical aims of Higher Education. There has been a growing interest in how to use these new forms of mobile social mass media communications for learning and development in Higher Education and an increasing amount of research is being done into the problems and opportunities to which this kind of education gives rise.

This thesis attempts to 'unpack' the various meanings of mobile learning in Higher Education and to draw relevant philosophical conclusions from those meanings as well as from the process of 'deconstruction'. Laouris and Eteokleous (2005) stress the need for a definition of mobile learning that takes into account all the implications of the mobile learning process for the philosophy of education. Nyíri (2002:1-4) has contributed to a philosophy of mobile learning that relies on Dewey's (1916) insights into democracy and education. He argues; as have others, that mobile devices are responsible for undermining and, in many cases, eliminating the fixity of traditional classrooms, lecture halls, laboratories and all the paraphernalia of traditional education, which depend for their success on static models of communication and traditional modes of transmitting the content of instruction in modern societies. Mobile devices are revolutionary in the sense that they transcend the boundaries of the 'structural' stasis of classrooms and lecture halls and their associated modes of

communication. Mobile devices do not have to be confined to one particular place in order to be effective.

1.2 Statement of the research problem

The research problem as a theoretical puzzle would be the following: people are not sure how mobile learning takes place and if learning is actually taking place when learners are using mobile devices. Then the main research question becomes: how should theories be revised to explore changes in the mobile learning context in the Higher Education landscape? The rationale of this study is premised on the fact that rapid evolution in information and communications technologies (ICTs) is reshaping learner behaviours and learning styles (Cobcroft, Towers, Smith & Bruns 2006:22).

Nonetheless, this is expected to provide a pedagogical rationale for mobile learning in the Higher Education landscape, and to ask the question of how the use of mobile devices in Higher Education relates to current theories.

This research problem takes into account the necessity of exploring the position of mobile and wireless technologies in Higher Education in the context of learning and instructional design theories. But because of the rapid growth of learning activity using mobile devices and the evolution day by day, of learning technology, the concepts and outcomes of mobile education are still confusing and uncertain. Despite the scholarly contributions of theorists and researchers such as (Ally, 2005; Sharples, Taylor & Vavoula, 2007; Ally, 2009), its meanings have tended to conflict, partly because it is perceived and unlocked differently by different audiences (Traxler, 2007:13). Therefore, any meaningful conceptualisation of the scholarship of mobile education must be written against the backdrop of its multiplicity of perceptions and expectations.

Learning theory for mobile learning is still confusing, and to understand how these devices will eventually contribute to learning, one has to "draw on the theories and practices of mobile computing and of e-learning, as well as on 'blended' learning that may combine face-to-face with virtual components" (Kukulska-Hulme & Traxler, 2005b:25-26). A succinct theory of mobile learning is likely to draw on the different learning environments and dynamics that are constantly emerging because of global technological changes. This is a challenging task because "the role of theory is, perhaps, a contested topic in a community that encompasses philosophical affiliations from empiricists to post-structuralists, each with different expectations about the

scope and legitimacy of a theory in their work” (Traxler, 2007:1). Accordingly, this research hopes to address the gap in mobile awareness in order to contribute to the theory of learning and an instructional design theory – to indicate how people learn with mobile devices.

Rapid learning activities and connectivity with mobile devices, wireless capability, and the day by day evolution of teaching/learning with technology, means that, according to Traxler (2007:5), the nature of mobile education or mobile learning is still emerging and is therefore still unclear. This can be seen as a research problem from three different perspectives:

- The technology of mobile learning and its interactions with other media of learning.
- Learning theory relevant to mobile learning.
- The position of mobile learning, handheld and wireless technologies in the Higher Education landscape.

1.2.1 The technology of mobile learning and its interactions with other media of learning

In terms of the technology of mobile learning and its interactions with other learning approaches, Laouris and Eteokleous (2005:2) argue that different people mean different things when they use the term ‘mobile learning’. This explains the non-existence of a clear and adequate educational definition of mobile learning. Therefore, understanding the concept ‘mobile’ sometimes depends on the concepts of technology, learning and learner mobility. Moreover, there is an interactivity of mobile learning with other learning approaches in Higher Education such as e-learning, conversational learning and distance learning. What is therefore, special about mobile learning compared to the other types of learning? Considering the future of wireless and mobile technology, Laouris and Eteokleous, (2005:3) argue that, in the next few years the mobile phone will be the primary source for radio and television signals, as well as the link to up-to-the-minute information. This is true, to a large extent given the pace at which mobile phones are penetrating different human communities of the world. In Africa, for example, mobile technology has reached even places with no electricity. But the use this technology to drive meaningful teaching and learning across different context and at the same pace is still a contentious issue.

The appearance and future expectations of mobile learning in social life signal mobility and a portable lifestyle. What are the expectations of Higher Education in terms of the revolutions of mobile and wireless technologies? The claim is that changes to university campuses and their electronic infrastructures will be given new meaning by wireless connections and mobility of learning. Moreover, learners will be nomadic, accessing learning and information at anytime, wherever they are located.

1.2.2 Learning theory relevant to mobile learning

To understand how these mobile devices will eventually contribute to learning, we need to “draw on the theories and practices of mobile computing and of e-learning, as well as on ‘blended’ learning that may combine face-to-face with virtual components” (Kukulka-Hulme & Traxler, 2005a:16-25).

A theory is a supposition or a system of ideas, which explains something based on general principles; the means by which the practice of an independent activity or event can be explained. Sutton and Staw (1995:371-372) state that, “like many words that are bandied about the word ‘theory’ threatens to become meaningless because its referents are so diverse. They include everything from minor working hypotheses, through comprehensive but vague and unordered speculations, to axiomatic systems of thought. Use of the word often obscures instead of creating understanding. Lack of consensus on exactly what theory is may explain why it is so difficult to develop strong theories in the behavioural sciences”.

A theory does not have one fixed meaning explaining one thing. It includes multiple meanings of reasoning and resonance. It is a space for unlocking situations or justifying actions based on a series of logical arguments and a set of relationships between concepts, constructs, or variables (Doty & Glick, 1994:231). For Gioia and Pitre (1990), “a theory is any coherent description or explanation of observed or experienced phenomena”. Therefore, the meaning of theory often depends on the context, the writer, and the audience. This definition dismisses references, data, variables, diagrams, and hypotheses as theory (Sutton & Staw, 1995:371). Despite this clarification, the elements are still confusing and authors and researchers sometimes use those five elements as signifiers of a theory. Learning theories describe how learning occurs (Reigeluth, 1999:12). For me, a learning theory is a synthesis of one's deep-seated beliefs about the educational process. A theory is a formal set of ideas meant to explain why something happens or exists. It is the principles on which a particular subject is based.

To sum up, the research problem focuses on exploring mobile learning surrounded by learning and instructional design theories, namely, learning theories in the Higher Education landscape whether associative (learning as activity), constructive (learning as achieving understanding) or situated (learning as a social practice).

1.2.3 The position of mobile learning, handheld and wireless technologies in the Higher Education landscape

A number of mobile learning platform projects and pilots are being run worldwide. From the literature on mobile learning, conference proceedings and journal articles, it appears that there are many concerns about the non-adequacy of theory with regards to mobile learning. The current psychological theories around mobile learning need rereading according to mobile learning requirements for an understanding of the mobile learning devices used in Higher Education. These undertakings generated further recommendations for the future use of mobile devices for teaching and learning and facilitated the search for in-depth understanding of the position of mobile learning in Higher Education. The learning theories that describe the new changes are not clear. There are also some interesting questions regarding location and context, how large or visible they possible to be, and whether there are 'levels' that might be 'active'.

The assumption is that learners may activate or create learning and instruction themselves. Jonassen (1994:2) argues that tools of learning might be taken away from educators and given to learners as tools for knowledge construction rather than media of knowledge conveyance and acquisition. The question is how this shift would fit in with natural centres of gravity of mobile devices in public and private places by means of the design of learning space. This research seeks to clarify the learning theories, and in some aspects, philosophy, in order to find relationships of learning and instructional design theories among mobile and wireless devices in Higher Education.

1.3 Research objectives

In order to explore the theoretical position of mobile learning in the Higher Education landscape, the research objectives are divided as follows:

Objective 1: To understand mobile learning in the context of learning and instructional design theories in Higher Education to clarify mobile learning theories.

Objective 2: To compare learning with mobile devices to learning with other learning media, in order to explore what mobile learning is and how it interacts with other learning approaches.

Objective 3: To illustrate the current changes in learning with technology, in order to understand and introduce learning spaces and the position of mobile technology in the Higher Education landscape.

1.4 Research questions

The question derived from the literature survey is: **what are the implications of mobile learning for Higher Education in the context of learning theory and instructional design theory?**

In order to explore the theoretical position of mobile learning/devices in Higher Education and the requisite learning theory for mobile learning, it is necessary to address the many new changes in the area of digital activities that are being observed in the field of technology, learning theory and with respect to learners themselves, based on social life changes and mobile devices. Therefore, the research was conducted using broad clusters of learning and instructional design theories. However, these theories are not related to mobile learning, though they are well known as psychological learning theories, because there is no single learning theory relevant to mobile learning as yet. For these reasons, the main research question is:

How must theories be revised to explore the change in the mobile learning context in the Higher Education landscape?

To achieve the research objectives and to answer the main research question, the researcher divided the main research question into the following sub-questions:

Sub-question 1: What are the differences between learning with mobile technologies and learning with other learning media and approaches?

Sub-question 2: How does the current pattern of learning with technology changing as a result of the introduction of mobile learning technology/learning to the Higher Education landscape?

1.5 Rationale of this research

Educators and learners need to form and develop a creative community when they teach or learn with mobile devices and they use thinking power and the wisdom of people for integrating portable devices with the mainstream. Innovation in this area requires rethinking the way we design, develop and deploy technological supports. Since mobile learning is spontaneous, it needs a “deep understanding of the affordability and inherent functional constraints of the technological components” (Hoppe, 2007:35). To this end, this research will highlight a number of changes of practice in Higher Education. These changes are: the change in learning and teaching practice and the relative importance of the theory of mobile learning in the Higher Education landscape.

Research into, and application of mobile learning potentially brings the rewards of placing institutions at the forefront of pedagogical practice and addresses student requirements for flexibility and ubiquity, that is, ‘anywhere, anytime, and with any device’ learner engagement (Cobcroft, Towers, Smith & Bruns, 2006:23). This research has the potential to stimulate discussions among educators and policymakers. It also hopes to contribute to the existing corpus of studies on mobile learning in this context.

While working as a lecturer in Higher Education and training future teachers in the field of instructional and educational technology, I did a master’s degree in Computer-Integrated Education (CIE) at the Sudan University of Science and Technology (SUST), (Sudan), which is affiliated to the University of Pretoria (UP), (South Africa). The course made use of distance and e-learning as well as face-to-face components to fill the gap of personal interactivity inherent in e-learning. During the course of study I observed that a number of educational practices are changing because of the shift from face-to-face learning to e-learning.

Various technologies have appeared in the field of educational technology to extend e-learning. Mobile learning (m-learning) makes use of widely used devices that are available to most people. Mobile devices are changing Higher Education. These changes have become evident from pilot reports on the practical aspects of mobile learning. The challenge facing mobile learning is how to maximise the interaction of mobile devices with conversational (‘face-to-face’) learning, distance learning, and e-learning in a ‘blended’ approach. How to integrate the new technology with the pedagogical aspects of Higher Education?

Finally, the study hopes to provide a basis from which we can develop an understanding of the theoretical position of mobile learning. Exploring mobile learning, which aims to employ mobile technologies in teaching and learning, relates principally to access, changing trends in pedagogy, and the alignment with institutional aims. Proposing a model for determining technology choices for effective learning and teaching in Higher Education includes appropriateness and access, ease of use and reliability, costs, teaching and learning approaches, interactivity, organisational issues, novelty, and speed. Whatever the list of criteria employed, an investigation of whether the right technology has been selected is arguably a key aspect of a comprehensive evolution of mobile learning (Cobcroft, Towers, Smith & Bruns, 2006:24).

1.6 Research methods

The research design and approach draw on grounded theory methodology as explored by Strauss and Corbin (1990), and Charmaz (2006). Grounded theory is a flexible research methodology that uses multi-methods to collect and analyse data. This process includes collecting, analysing, categorising, and writing up research findings.

The research focused on the theory of mobile learning and instructional design for learning spaces in the Higher Education landscape. The research pursued a qualitative research methodology, namely, understanding the theoretical, design and practical processes and experiences of how people learn with mobile technologies in the context of current learning and instructional design theories.

The research instruments and tools of data collection were interviews and literature analysis. Data was collected and the interviews were assessed according to thematic and conceptual analysis. The literature review of mobile learning, learning, and instructional design theories are interlaced with multidisciplinary data collection and analysis. I analysed the data from interviews as a way of understanding the learning theories and instructional design theory of mobile learning.

1.7 Theoretical research perspective

Useful theoretical terms appropriated from post-structuralism include language, difference, force, power, discourse and deconstruction. The appropriate theoretical research perspective for this research is deconstruction theory. The forerunners of the theory of deconstruction state that it is impossible for a text to have one fixed

meaning, and they emphasise the role of the reader in the production of meaning (Wehmeier, 2005:397). For these theorists, any text lends itself to myriad interpretations depending on the context, the values and cognitive ability of the reader. Deconstruction is therefore important to this study because it can help us to understand the multiply meanings of mobile learning.

Wehmeier (2005:397) defines Deconstruction in the Oxford Advanced Learner's dictionary, as a philosophical theory that considers it impossible for any given text to have one fixed meaning, and that any meaning attributed to a text has to be co-produced by the reader in conjunction with the author. Such multiple meanings even become evident to the reader when he or she peruses the same text at intervals over a long period of time. This theory had effect my reading and analysis of text and interview data. Hence, new meanings emerge with each new encounter with a text in different circumstances through repeating the reading over time.

Today, in the field of educational theory analysis, the notion of disinterested theorising stresses the situatedness and responsibility of the scholarship. Although Deconstructionists emphasise the subjectivity of meaning, a text is often written "for someone, from a position and outlook, within a context of issues and circumstances which each impinge upon the pursuit of subjectivity and each of which assigns to the author(s) an obligation to reflect upon the social and practical effects of what is written or said" (Burbules, 2000:280). If one understands deconstruction in that sense, it is impossible to attribute one fixed meaning to the concept of mobile learning. It would be necessary, in order to arrive at a coherent understanding, to consider the relationships that exist between each of the words that are used to describe the phenomenon of mobile learning. The use of this approach to explore mobile learning presents an enormous challenge because there are so many words and terms that are used to explain and define mobile learning as a phenomenon.

To place the phenomenon of mobile learning within the context of the philosophy of education, we need to "deconstruct [and] break down the walls to open up new spaces" (King, 2006:171). Here one needs to examine some of the foundational assumptions and presuppositions on which all-previous understandings of the term 'Higher Education' is constructed. By using mobile communication devices to deliver Higher Education content it is possible to remove the physical walls of the classroom and replace them with virtual mobile learning environments. While the content of the educational material being conveyed might remain the same, it is delivered by means of a radically new mobile technology that uses the advantages of the Internet –

convenience and portability – to facilitate education at any time and in any place. King (2006:171) highlights how radically different the procedures connected to mobile learning are when he writes that “by breaking down the assumptions and process behind writing and speaking, we can go beyond them and find new ways of thinking about the world”.

These observations and way of analysis and thinking may help me to understand the position and significance of mobile learning in the history and expected future for the purposes of Higher Education, and it is possible to claim that the portability and mobility of these technological devices has revolutionised the meaning of terms that had previously been extensively defined in the philosophy of education.

1.8 Constructing arguments

Linguistically an argument is a contradiction. It is a combination of two or more statements, ideas or features of a situation that are contrasting to one another, seeking a unity of discourse. The goal of an argument, in this thesis, is to open up possible alternatives and arrange an existing one, in a bid to change the possible meaning later. Theory building has the same discourse unity of an argument – justification or harmonisation of statements. For example, Dubin (1969:2) claims that theory building is the intent to bridge the gap between theoretical models and empirical research in a way that proves intensely practical for daily application to the tasks of the research. Here the bridge is a dynamic rather than static one; it is a functional bridge, which concerns itself with the interaction between theory and research.

However, traditional approaches to theory building are not entirely consistent, especially with the emergence of alternative research paradigms in organisational study (Gioia & Pitre, 1990). In order to build this linking bridge and explain the implications for this study, a critical analysis of the concepts had focus on theoretical models (theory) and had to be linked by arguments of research operations (research paradigm) as well as analytical ability (analysis). The whole work of such research is to rebuild the relationship between research, theory and discourse. Theory building is the symbolism of an empirical world, which can be understood by applying individual intelligence. These theoretical models are practical and the predictions derived from them are the mediums through which modern man is increasingly ordering his relationships with the universe. But, human beings usually argue and pass judgement. The theoretical reason for these arguments, especially in the context of

this research, "is that theory development does not come 'off the shelf', but rather is generated or 'grounded' in data from participants who have experienced the process" (Creswell, 2007:63). For Creswell, theory building especially for educational purposes involves blending theoretical conceptions and empirical evidence. This approach legitimises and adds value to the theory (Traxler, 2007).

It can however be argued that there is a distinction between asking questions and doing research, where the analysis of theory building begins. Theoretical observation recognises that students do research according to educational approaches that have changed in response to paradigmatic developments (Denison, 1996). There is greater emphasis on collaborative rather than individual inquiry. The uncertain nature of empiricism is more apparent, although argumentation has become an important part of some of the approaches of sustained knowledge. In this case, "the fundamental task of education is to [socialise] youth into this knowledge-creating civilization and to help them find a place in it" (Scardamalia & Bereite, 2006:98).

Significantly, this conceptual trajectory is more concerned with the growth of educational and research paradigm changes driven by societal discursive situations. However, for me as a researcher in Higher Education doable to develop critical analytical skills for crafting arguments toward knowledge building rather than just doing research in the manner of immediate empirical study. Scardamalia and Bereite (2006) list six themes that illuminate a shift from treating students as learners and inquirers, to treating them as members of a knowledge-building community. These themes are:

- *Knowledge advancement as a community rather than individual achievement.*
- *Knowledge advancement as idea improvement rather than as progress toward true or warranted belief.*
- *Knowledge 'of' in contrast to knowledge 'about'.*
- *Discourse as collaborative problem solving rather than as argumentation.*
- *Constructive use of authoritative information.*
- *Understanding as an emergent knowledge (Scardamalia & Bereite, 2006:99).*

This research focuses on interviews, themes, literature and critical analysis. It seeks to identify how the main proponents of knowledge categorise concepts and their roles in reproduction of discourse unity. Here, the arguments are based on the thematic

analysis of interviews and literature that examines the rhetoric or meaning of texts, paying attention to the strategies for addressing the same analysis of the true properties of the text. This suggests that all text–context relations for the production of interpretively questionable conditions have the scope and legitimacy of theoretical characteristics. However, authors who are interested in devising academically strong theories “might start by reading the diverse literature that seeks to define theory and distinguish weak from strong theory” (Sutton & Staw, 1995).

In terms of critical analysis, Foucault (1989) points out that themes under examination are always reflexive categories. They may be principles of classification, normative rules, or institutionalised types. They are also facets of interdisciplinary discourse that deserve to be analysed together. Themes have complex relationships with one another; they do not possess intrinsic, autochthonous or universally recognisable characteristics. In this case, the researcher workable construes reading for finding themes as intellectual unity of categories. These categories, in this research discipline, aim to crystallise and triangulate the data collected from multiple sources such as generated data, expert interviews and empirical books and journals articles. This approach facilitates the discovery of theoretical characteristics that may help to craft understandable mechanisms of mobile knowledge building (Boote & Beile, 2005). In this study, the analysis process aims to find possible multi-meanings for a text that results when interviewing mobile learning experts, with emphasis on the role of the reader analysis in the production of new meaning and knowledge.

1.9 Significance of the study

This research deals with the multidimensional phenomena of mobile learning, technology, learner and learning, and instructional design theory. These combinations make the study significant for educators, stakeholders, learners and instructional designers in Higher Education.

The study explores the theoretical position of mobile learning and this would be of significance for educators, learners, students and stakeholders in Higher Education to establish mobile-learning knowledge in the Higher Education landscape. The revision of learning and instructional design theory in the context of mobile learning regarding the implication of the current issues of growth of technology, digital and wireless instruments and tools of teaching, learning and instruction in a mobile age, requires educational change in order to fulfil the Higher Education needs of mobile learning knowledge and experience.

To do so, the study attempts to illustrate the changes in Higher Education brought about by mobile devices as they change knowledge regarding e-learning and m-learning in the present era. In this way the study aims to advance mobile learning theory and practice in the Higher Education landscape.

1.10 Limitations of the study

The research was conducted from 2008 to 2010, in Cape Town and Pretoria, (South Africa). It focused on the learning theory of mobile learning and instructional design for learning spaces in the Higher Education landscape. This involved the educational technology of mobile devices, distance learning and present e-learning, as well as resource access, learning and collaboration learning. It explored learning presentations in current instructional design and learning theories. Interviews were limited to Higher Educational institutions such as universities. Research design and approach are limited by qualitative grounded theory. Learning and instructional design theories were epistemologically limited by the cluster and categories of modern learning theories (associative, constructive and situated) for this study.

1.11 Brief overview of the chapter

This thesis explores the position of mobile learning among learning and instructional design theories in Higher Education. It investigates the technology of mobile learning and its interactions with other media of learning in order to advance the relevant learning theory of mobile learning. This would provide a rationale for the position of mobile learning, as well as handheld and wireless technologies in the Higher Education landscape.

There is an interactivity of mobile learning with other learning approaches such as e-learning, conversational learning and distance learning in Higher Education. What is special about mobile learning compared to these types of learning? In terms of theory related to mobile learning, it is obvious that a theory for mobile learning is non-existent. The research problem centres attention on understanding mobile learning in the Higher Education landscape with respect to learning and instructional design theory, namely, theories of education, which are associative (learning as activity), constructive (learning as achieving understanding) and situated (learning as a social practice).

Mobile learning (m-learning) is learning with devices that are widely used and available in most people's pockets or hands. The challenge facing mobile learning is

the interaction of mobile devices with conversational (face-to-face) learning, distance learning and e-learning in a 'blended' approach. Most of the articles about mobile learning in academic journals describe research in terms of the practicalities of mobile learning.

To describe mobile learning, one has to postulate considerable learning theories. Educators are not sure how learning takes place with mobile learning and even if learning is actually taking place when learners are using mobile devices. How does learning take place when mobile devices are used as teaching and learning tools? Distance learning includes e-learning, open learning and virtual reality (VR) learning.

This research focuses on the learning theory of mobile learning and instructional design for learning spaces in the Higher Education landscape. I analysed the data from interviews and current literature, as a way of understanding learning theories and instructional design theories for mobile learning. I compared practical learning with mobile devices to other learning media such as digital learning, including e-learning and distance learning.

1.12 The structure of the thesis

This thesis is divided into 6 chapters: Introduction, Literature review, Conceptual framework, Research method and approach, Findings and discussion, and Conclusions and recommendations. In addition, Chapter 2 is divided into two sub-sections and Chapter 5 is divided into three sub-sections. The chapters are presented in the table below:

Table 1.2: The structure of the thesis

Chapters No.	Title	Contents
1	Introduction	
2	Literature review	Section 1: Signs of mobile learning era: mobility as paradigm shift Section 2: Theoretical position of mobile learning: resonance to learning and instructional design theories
3	Conceptual framework	Defining mobile learning in the Higher Education landscape
4	Research design and approach	Research design and approach
5	Findings and discussion	Section 1: Implication of mobility of technology Section 2: Implication of mobility of learners Section 3: Implication of mobility of learning
6	Conclusions and recommendations	

Chapter 1 describes the research problem, objectives, questions and the rationale of the study.

Chapter 2 deals, in the first section, with signs of a mobile learning era, the driver of mobility of citizenship and globalisation, people demography, work and economy, private and public, individualisation and socialisation, commoditisation and policy in practice. The second section reviews the current literature of learning and the instructional design theories of behaviourism, constructivism and situated theories that resonate with mobile learning in Higher Education.

Chapter 3 contains an article published recently in an international journal (with permission). The article is a conceptual framework for this study. The conceptual framework defines mobile learning according to the three emergent concepts of mobility of technology, mobility of learner and mobility of learning.

Chapter 4 clarifies the research method and approach of qualitative grounded theory. Data was collected and analysed in a loop situation aiming at saturation of the data.

Chapter 5 presents three sections based on the implications of mobility of technology, mobility of learner and mobility of learning stemming from the analysis of interviews conducted with experts in the field of mobile learning in Higher Education.

Chapter 6 concludes the research and suggests recommendations.

1.13 Ethics

The study conformed to the research ethical consideration of existing learning theories and instructional design theories for mobile devices used in the Higher Education landscape and accessible to educators, researchers and stakeholders. I interviewed experts who are using mobile devices in teaching and learning. These stakeholders were experienced individuals in the field of mobile learning. The participants were all older than 18 years of age. Confirmation is given that the data collected for the study will do no harm to anyone concerned. Participation in the research was voluntary. No incentives were offered, as participation was entirely academic.

The article in Chapter 3 is presented with the permission of the journal's editor. The article's format and style were changed to match the Cape Peninsula University of Technology's technical thesis format.

CHAPTER 2

LITERATURE REVIEW

The aim of this chapter is to examine the body of literature on mobility and learning. It discusses how mobility creates various paradigm shifts. It also explains the education movements from traditional to modern; discusses the relationship between learning and instructional design theory and how this relationship impacts on mobile learning in the Higher Education context. The chapter examines the body of knowledge on theories, principles and theorists, exploring how these theorists build the theory of learning and instructional design. The chapter throws light on how mobile learning relates to the learning and instructional design theory that applies to mobile learning, learners and technology. The chapter looks at how knowledge building in education and its tools, technology, theory and theorists are being developed over time. This chapter analyses the literature by themes, categories and concepts in order to respond to the following question:

What are the implications of mobile learning for Higher Education in the context of learning theory and instructional design theory?

The chapter is comprised of two sections - section 1 explores mobility from the view of mobile learning and learning with technology, the literature, thematic and concept analyses aim to assess the underlying shift in educational technology. The literature analysis examines the paradigm shift from traditional learning to distance learning, e-learning and mobile learning. The demands of socio-economic change have implications resulting in greater mobility and a change from traditional to modern lifestyles (Jarvis, Holford & Griffin, 2003). The movement from an agricultural age through an industrial age to an information age has many implications. This includes an indication that the future will see a growth in mobile learning (Keegan, 2002). Mobile learning is becoming more attractive to practitioners while the term e-learning is generally losing popularity (Cronjé, 2007). Mobile learning has introduced radical changes in instructional designing in the mode of education delivered. The changes proposed into the practice of learning with technology vary with socio-economic lifestyles.

However, section 2 explores the relationship between learning and instructional design theories in the context of mobile learning in Higher Education. It evolved further, learning and instructional design theories, theorists and principles that have applied to mobile learning from the past to the modern era.

SECTION 1

SIGNS OF A MOBILE LEARNING ERA: MOBILITY AS A PARADIGM SHIFT

2.1 Introduction

The objective of this section is to discover the various paradigm shifts of mobility, socio-economic lifestyle, educational change and the movement of multi-educational technologies in Higher Education. The following inscribed emergent concepts of technological and mobility shifts will be expanded in the next paragraphs in details:

- Mobility of citizenship and globalisation
- Mobility of people demography
- Mobility of work and the economy
- Mobility of privacy and public
- Mobility of individualisation and socialisation
- Mobility of commoditisation
- Mobility of policy into practice
- Mobility of instructional technology (e-learning and m-learning)

Themes and categories of concepts are emerging from the literature on mobile learning and educational technology; Mobility drives the shift in society and makes as it necessary to incorporate learning with technology in Higher Education.

2.2 Mobility

Overall, social interactive movements in the last millennium – globalisation and immigration, people demography, work and the economy, privacy, individualisation, commodification and policy into practice led to the development of innovative educational teaching and learning tools. However, theoretical observation of the practicalities of mobile learning in the written literature analysis makes it clear that there are fundamental changes in learning and instructional approaches that have resulted in changing the underlying theoretical educational base of learning and the mode of instructional delivery.

2.2.1 Mobility of citizenship and globalisation

The, age of globalisation is characterised by the endless mobility of communities. Castles and Davidson (2000) refer to the increasing contact with and exchange of

information. This mobility of citizenship not only affects people's perceptions of life but also the way they interact with one other internationally. This may have appealing impacts on teaching and learning.

Soysal (1994) and Castles (2000) ascribe globalisation to humanistic capitalism and changes caused by political and ethnic issues.

Globalisation is perhaps the most important of all the advances in mobility. It has led to the adaptation of learning policies worldwide. Change may occur at different rates, but its effects are global. Thus, although national identities still exist increasingly the world economy is subject to corporate capitalism, which transcends national boundaries.

Globalisation has been defined as "a social process in which constraints of geography on social and cultural arrangements recede and in which people become increasingly aware that they are receding" (Jarvis, Holford & Griffin, 2003:19).

Globalisation has resulted in the greater number of partnerships between universities in established and emerging economies. Modern universities "are at a historical juncture, transitioning from the industrial era to the information era; and from a national perspective to a global one" (Siemens & Tittenberger, 2009:10). The development of a theory of mobile learning engenders an understanding of the increasing global changes and the new vision of universities.

As a result, research on educational technologies needs more theoretical, intellectual movement to and multidisciplinary global research, because technologies have relative meanings to mobility and globalisation. However, research is not just about technology; it is about the dynamic of social educational lifestyles. Siemens and Tittenberger (2009) see the challenge as that "the challenge of this often repeated assertion – namely that we are on the precipice of a complete shift in the framework of education – is that research, by its nature, is not necessarily concerned with trends. Research is intended to describe phenomena occurring now, and is concerned with ways to unearth or discover important principles on which we can base subsequent action and research".

The challenge for education and specifically educational technology is that the use of technology for learning is influenced by developments in numerous areas such as

technology itself, global trends in market economy growth, immigration patterns, and intellectual shifts (Siemens & Tittenberger, 2009).

Of course, educational processes and research on emerging technologies are now more dynamic and tie in with global social interactivities learning and multidisciplinary aspects. Hence, related research can point to dramatic transformations. New demands are being added to research into emerging technologies for learning as mobility increases.

Educational processes are moving from a national to a global era. Information and access to information is at everyone's fingertips. Global television channels are accessible through mobile technologies everywhere and at anytime – one can see world news on various television channels instantly.

With regard to educational technology issues, Young (2008) indicates that there is a need for alternative instructional design models and models of culture that meet the globalisation of technologically advanced societies. The inclusion of culture should be included in the design process to meet design challenges in the mobile learning age.

2.2.2 Mobility of people demography

The traditional patterns of family, kinship and domestic life are rapidly breaking down, and the form of stability and continuity these represented is disappearing (Jarvis, Holford & Griffin, 2003:19-20). The mobility of social lifestyle gadgets has changed the way we communicate. The challenge is to design a comprehensive bilingual knowledge for the mobile age.

The issues of demography among technological change described by Jonas (1979:22) raise philosophical questions of ethics with respect to the objects of technology that “are defined by the major areas of their impact and thus fall into such fields of knowledge. The substantive problems of social mobility and communication cannot even be sketched here, let alone the ethical policies for dealing with them”.

2.2.3 Mobility of work and the economy

The introduction of technologies has caused a paradigm shift in workplaces and economies. The culture of mass production associated with 'Fordism' is dissipating, creating space for new opportunities (Jarvis, Holford & Griffin, 2003:19). For example, service industries now form the most important economic sector because of their abilities to connect and develop relationships between people. The emphasis now is

on the need for continually developing skills in new technologies. Also, "the idea of 'workplace' is changing, as working from home has become more prevalent and the proportion of economically inactive people in the workforce has increased" (Jarvis, Holford & Griffin, 2003:20).

Technology has impacted on work and economy. Both of them are mobilised from one discipline to other. This mobility has affected the way people learn in work environments. Mobile technology has changed the way human beings function in work places (Dron, 2007; Botha, Vosloo, Kuner & van den Berg, 2008). All these factors possibly impact significantly on mobile learning because they signal the way people adjust in time and how they learning while working.

Mobile learning has a potential to offer training for those who do not have time to attend formal learning. Universities and work places strive to make a variety of learning materials accessible through mobile technology. The mobility of work and the economy has strong implications for mobile learning and the development of a theory of mobile learning.

2.2.4 Mobility of privacy and public

Historically, education in the Socratic and Platonic modes was based on apprenticeship as institutionalised education. An apprenticeship, as an adult learning approach, is learning a trade from a skilled employer. The apprentice is someone who agrees to work for a fixed period for a low wage. Moreover, education has moved from childhood learning, to adult, to lifelong learning. "School education grew by virtue of its compulsory nature and education comes to be seen by many people as preparing children for adulthood" (Jarvis, Holford & Griffin, 2003:2).

In the last decade, most of the research in the field of educational technology and instructional technology has been seeking good educational practices. Nonetheless, Amiel and Reeves (2008) argue that, "through more democratic research practices and recognising technology as a system beyond its tools, researchers can increase their impact on educational practice".

Learning is moving from a process to learning as an institutional phenomenon. Learning has acquired a social institutional meaning expressed in terms such as the learning society, the learning organisation and even lifelong learning. This has resulted in considerable confusion since human process tends to get subsumed into institutional phenomena. It is difficult, to distinguish between lifelong learning as a

human process through the whole of an individual's life and lifelong learning as governmental strategy (Jarvis, Holford & Griffin, 2003:4).

Mobile technologies may reshape the boundaries of Higher Education. However, there is a need to reconceptualise the boundaries between universities and the world, as well as between private and public. Siemens and Tittenberger (2009) point out that societal trends will be a challenge:

- **Formal and informal learning, public and private:** now learning takes place through volunteering, hobbies, work-based activities, communities of interest, political and social activism, and raising or being part of a family.
- **Open and closed:** the struggle of open/closed will continue to be a major point of tension in business and education in the foreseeable future.
- **Expert and amateur:** amateur-produced information is generally easily accessible (in language and format) and not necessarily good, whereas expert-produced information is often inaccessible (in language and format).
- **Hierarchy network and command/foster:** hierarchical command and control models are limited in their ability to respond to complex interactions and information abundance, when applied to education. This line of reasoning suggests that networked models of learning will replace existing curricular models.
- **Pace and depth of growing information worldwide:** continual change and distraction may contribute to developing expertise in managing high flows of information, but may not develop particular subject matter expertise, as extensive thought is not applied to the content itself (only the process).
- **Epistemology and ontology:** rapid growth of information requires Higher Education to change its focus from knowing (epistemology) to being (ontology). Throughout the world there is a change from knowledge acquisition to knowledge processing. (Siemens & Tittenberger, 2009:6-7).

Educational research may concern itself with an in-depth examination of what is meant by 'university' in the global era. Current educational practices made little use of the increase in digital connectivity. They are trying instead to adapt the technology to old-fashioned ideas of school, rather than to adjust education to reflect the technology-enabled world (Van Hooft & Vahey, 2007). Current schooling does not fit well with the way contemporary learners communicate. Generally, mobility needs theories that describe relevant educational principles and processes.

2.2.5 Mobility of individualisation and socialisation

Learning is moving between individual and social intellectual growth. However, it is difficult to monitor and evaluate individualisation, especially in terms of successful implementation. For Berry (2003:291), schools should know what they want and know how to get it.

Siemens and Tittenberger (2009) state that “the process of knowledge production is moving to more social models and socially distributed knowledge production, as businesses and organisations are placing greater emphasis on distributed teams and collaboration” (5) in various ways of mobilising society. Societies need educational institutions to move their emphasis from serving the elite, to serving the masses.

By the 1980s, there were still only a small percentage of young people going on to Higher Education, leading to an under-supply of knowledge workers (Jarvis, Holford & Griffin, 2003:3-4).

Many of the various social activities on any particular day involve many forms of digital mobile tools. In fact digital mobile technologies might continue to develop and change in many ways.

Van Hooft & Vahey, (2007:4) predicted some sets of future tools of technologies in digital mobile: These include:

- *Personal (one-to-one or one-to-many access);*
- *Mobile (always-on-you technology);*
- *Networked and connected to the Internet 24/7 (always-on technology);*
- *Accessible (cheap and easy to use);*
- *Flexible (users have choices);*
- *Social (collaboration and allowing for creating, sharing, aggregating, and connecting knowledge);*
- *Multi-modal (support the consumption and creation of different media, including text, image, sound, and video); and;*
- *Contextual (context-awareness, but also context-creating).*

Van Hoof & Vahey's tools provide a useful framework for the construction of a theory of mobile learning which can be useful in many unprivileged communities especially in Africa. This stems from the fact that some of the many technological challenges in Africa are affordability and limited connectivity.

Education is moving from a system of the education of one person, such as an apprenticeship, to the education of many people. These demands are being influenced by mobile technology. While higher academic institutions use traditional tools for teaching and learning, current learners live with digital, movable technologies with access to huge amounts of information in digital media format. Education is moving from being teacher-centred to student-centred. The values of student-centred learning have become much more widely recognised, and were often taken for granted in the past in education as a whole. However, the extent to which this approach was practised, rather than being merely rhetoric, is open to question. Nevertheless, the rhetoric of learner-centred education is still very strong, not only in adult education, but also in human resource development and school education.

Additionally, it is increasingly recognisable that more learning occurs outside of formal educational institutions, and also that there is now a learning 'market'. The learner is being seen as central to the process and the nature of teaching is changing considerably (Jarvis, Holford & Griffin 2003:5-6). Moreover "today's students prefer quick and open access to information that is networked/hyperlinked; actively networking and communicating with many others; digital tools over print; multimedia before text; just-in-time' learning that is relevant and useful, and expressing their creativity" (Van Hooft & Vahey, 2007:4).

A New instructional design might emerge from understanding how learners learn from mobile technology. This includes 'just-in-time' learning, addressing learner styles or needs, keeping it simple, and focusing on the smaller activities of mobile learning as just-in-time support and training where needed. Cronjé (2007:4) indicates that, "standards' of e-learning development refer not to quality, but to cross-platform compatibility. The well-known system simply ensures that various systems talk to one another, allowing re-usability of learning objects – that is to say, if the objects were used in the first place". For him, e-learning is about familiarisation with modern technology and the development of learning systems that speak to individual users and more responsive to the specific challenges of the learning environment. It is a not about adopted generic systems, which then pose a re-usability hurdle. It is about tailoring systems to fit neatly in their context. ,

2.2.6 Mobility of commodification

Individualism and market forces mean that styles, along with other cultural goods (even knowledge itself), are increasingly seen as commodities. Their value depends on what they can be bought and sold for in the marketplace. Lifestyle and culture are replacing traditional systems of value and belief. The media and other forms of communication are replacing traditional education as a basis of social life (Jarvis, Holford & Griffin, 2003:20). This can attribute to the visible technological changes in the telecommunication industry and the increasing number of technologically savvy learners in universities today.

According to Howell & Obren, (2003:5), "lower costs of data transmission, and the emergence of new computer-based applications requiring transfer of data between locations, have created significantly new opportunities for telecommunications companies". This means cheap and easy access to vast amounts of information, which learners can use for their own academic development. It also means new modalities for teaching, which can transform the teaching and learning experience.

Also "technological innovations in bandwidth, storage, processing speed, software and hardware have directly influenced education, creating new opportunities for learner-learner/educator and learner-information interactions" (Siemens & Tittenberg, 2009:216).

Although this promotes more intellectual exchange between learners and educators, it also poses a major challenge especially to learners who lack the meta- cognitive ability to use the information to bear on their academic development. Nevertheless, "practice has become a more central situation in teaching and learning and, with the development of experiential learning theories it is hardly surprising that problem-based education and work-based learning become more significant" (Siemens & Tittenberger, 2009:6-7).

This is in accordance with industry's own aims to see that courses leading to master's degrees become totally work-based. Today, we are also beginning to see practitioners of instructional design emerge and there is an increasing emphasis on practical technological knowledge. The relationship between theory and practice is shifting, and we are beginning to see arguments about theory coming from practice rather than the other way around. However, this creates a number of difficulties in assessment for traditional educational institutions used to assessing cognitive

knowledge through the traditional examination system. Now new ways of assessing learning have to be devised, including assessing learning that has occurred outside of educational institutions (Jarvis, Holford & Griffin, 2003:7).

Education is moving from single-discipline to multidisciplinary and integrated knowledge. Following the 'Age of Enlightenment' and the Industrial Revolution, individual disciplines of study emerged and knowledge about society began to be categorised by discipline (philosophy, sociology, psychology and so forth). Each of the disciplines developed its own array of sub-disciplines, and these sometimes overlapped with each other – social psychology etc. As research and study become more practice based, knowledge became integrated rather than multidisciplinary. Knowledge is now considered a 'seamless robe' and the idea of 'practical knowledge' has emerged. Practical knowledge – such as nursing or teaching knowledge – is integrated and about doing things. It is impossible to divide it into separate elements since it has never been anything other than an integrated whole. Practical knowledge is integrated and subjective (Jarvis, Holford & Griffin, 2003:7-8).

"Mobile infrastructure is reaching the point of being pervasive, educators need to adapt from a role as transmitters of knowledge to guiders of learning resources. In addition, technology developers need to respond to concerns of security and privacy while designing devices and services which learners both want and will pay for" (Naismith, Lonsdale, Vavoula & Sharples, 2004:36). This requires a student-centred approach with the educator acting simply as a facilitator. This means more emphasis on mobile learning using different technologies but also mindful of emergent issues of security and privacy.

2.2.7 Mobility of policy into practice

Mobility of policy and its influence on technology education has had visible implications for learning with technology in Higher Education. However, "by the end of the 1980s education coupled with market reform became the dominant position in educational policy. Technology education was seen as a means for developing the knowledge, skills, attitudes and values that allow students to maximise their flexibility and adaptability for future employment, mainly, and for other aspects of life as well" (Pavlova, 2003:53).

Education is moving from concentrating on knowledge as 'truth' to knowledge as relative, information, narrative and discourse. This change makes it hard to regard knowledge as a statement of truth any longer. People are now talking about

something relative rather than static. Policy can be changed again as soon as some new discovery is made that forces people to change their thinking. The world is awash with new discoveries – this means that there is a greater need for knowledge-based occupations to keep up with the new developments in knowledge. The relationship between knowledge and truth questioned and it becomes impossible to apply dated knowledge (theory) to practice. Knowledge has become information, that might be useful, or data (Jarvis, Holford & Griffin, 2003:8).

Foucault, (1989) regards knowledge as discourse and, for him, discourse is ideological. He recognises that knowledge that becomes public or popular is rarely value-free and, its presentation furthers the cause of certain powerful groups in society rather than others. Hence, education is moving from rote learning to learning as reflection. Knowledge was regarded as something true, something that had been verified either by the force of rational logic or scientific research. It was to be learnt, that is to be memorised, as truth. Learners were expected to grasp the truth of the scientific discovery and remember it. However, knowledge has become narrative and even discursive.

Society, in the learning and mobility era, has now become reflexive. The whole process of change has produced a society that is reflexive of its own practices. In the same way, "learning has changed from remembering 'facts' and 'knowledge' to seeking to understand and be critically aware of the things to be studied. Reflective learning has become much more prevalent because of the changes in contemporary society. No longer experts' information is believed as truth, it may be regarded as discourse and critically reflected upon before either accepting it or rejecting it" (Jarvis, Holford & Griffin, 2003:21). The same applies to the 'knowledge' that teachers teach. Students need to be helped to reflect critically on the information with which they are presented. The idea that the teachers have the truth to teach is outdated. Although they can transmit information and data, they can only act as interpreters of many forms of knowledge (Jarvis, Holford, & Griffin, 2003:9-10).

These characteristics have resulted in the creation of modern education. Modern education systems originated in societies based on the application of science and technology. They were industrial, commercial and urban societies with mass communication systems, growing populations and increasingly popular political institutions. They reflected belief in stability, confidence and progress. To be educated in such a society meant to be socialised into knowing what to do, believe and expect (Jarvis, Holford & Griffin, 2003:17).

The modern functions of education may be summed up thus:

- *To transmit the kind of knowledge and skills required to sustain industrial economics, especially the scientific and technical knowledge on which they were based.*
- *To reinforce prevailing cultural values in society – the beliefs and attitudes to which people were expected to conform.*
- *To select the people most fitted to fill the roles which society needed, and to allocate them to an appropriate status or position in society.*
- *To reconcile people's aspiration with social needs, so that they accepted their place in society.*
- *To maintain and reinforce social order cohesion because it encourages people to conform to prevailing norms and culture.*
- *To control and manage individuals' aspiration, so they are 'fitted into' the social structure of employment, class or social status in ways they accept.*
- *To produce the workforce necessary for an industrial or post-industrial society, with its various divisions of labour, skills, careers and so on (Jarvis, Holford & Griffin, 2003:17-18).*

As a result of these characteristics of modern society, educational focus has shifted to lifelong learning. Institutions advocated a science of education that took a step-by-step approach to learning. Schools would refine raw elements (i.e. students) by graduating their spirits through stages of enlightenment – "teach everybody everything" – and eventually enable everyone to become a functional member of society (Albirini, 2007:228). In the era of mobile learning, there are a growing number of developments in technology that are shaping and mobilising the new society and education as well.

2.2.8 Mobility of instructional technology (e-learning and m-learning)

The use of technology for educational purposes dates back to the Second World War, when it was simply called an 'educational technology'. During this period "the complex term involve[d] a clinical, systematic analysis of the entire teaching and learning process in an attempt to maximise its effectiveness and quality and enhancement of teaching and learning professional" (Percival & Ellington, 1984:12). There was also a significant use of abbreviations related to the two educational aspects – 'technology in education' and 'technology of education'. The focus was always on the technology

rather than on the significance of educational technology for learning and for the learner's benefit. But for Percival and Ellington (1984:12), 'technology in education' is the popular impression of what educational technology was about, explicitly and with audio-visual aids. Audio-visual aids included hardware and software used in with the equipment. 'Technology of education' is about the technology itself. It ignores the learners and others aspects of teaching and learning.

To recognise 'technology of education', Percival and Ellington (1984:13) suggest that the principle role of educational technology is to help improve the overall efficiency of the teaching and learning process in many ways, such as:

- *Increasing the quality of learning, or the degree of mastery.*
- *Decreasing the time taken for learners to attain desired goals.*
- *Increasing the capacity of teachers in terms of numbers of learners taught, without reducing the quality of learning.*
- *Reducing costs, without affecting quality (Percival & Ellington, 1984:13).*

Instructional technology centres in universities can encourage departments to use Information and Communication Technology (ICT) tools effectively and integrate them into an educational environment, and to offer in-service training. They centres can organise and decide which ICT resources will be purchased and how available resources could be used most efficiently. They can provide peer support to lecturers and offer ICT resources to the public (Goktas, Yildirim & Yildirim, 2009:200). Kukulska-Hulme and Traxler (2005b) consider technology's potential to support situated learning as one of the most valuable assets of mobile devices. These devices can be used in different places, including outdoors or in automobiles (Norris, Shin & Soloway, 2007:6).

In practice, electronic learning (e-learning) is a general term, which refers to computer-enhanced learning. E-learning provides the technology and associated methodologies in learning using technology to support learning for education. Computer-based activities are integrated with practical classroom-based situations. The main type of methodology of learning in e-learning is computer-based learning. While it can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which educators use computers for teaching purposes in conjunction with conversational learning. The concept generally sees learning as being distinct from the use of computers in some ways where learning is at least a marginal element of the experience.

Web-based learning is a type of learning that is delivered over the Internet using a web browser (Alessi & Trollip, 2001). It frequently includes interactive methods, such as bulletin boards, chat rooms, instant messaging, audio-conferencing, video-conferencing and discussion threads, and is often self-paced. However, some systems allow for online testing and evaluation at specific times. E-learning methods often depend on learning that takes place with computers in laboratories, lecture halls and classrooms. In fact, it involves not going outside the closed areas. The e-learning phenomenon is forcing education to re-examine and redesign learning. It puts the spotlight on past practice, exposing such practice to the true theory of learning. In addition, the growth of psychological constructivist learning theory helps e-learning to be devolved better. However, most of the methods of e-learning with CDs or WBL depend on their approaches to constructivist learning theory as scaffolding (Alessi & Trollip, 2001). The constructivist approach allows learners to construct their own meaning of the universe in practice, by doing activities and repeating them, and learning mostly through understanding in specific events (Alessi & Trollip, 2001).

The growth of educational practice requires more connectivity to web-based learning and mobile technology to allow all learners to access their learning at increasing rates. Practically, there is a social indication of mobile technology for communicating and interacting. Theoretically, educators are not sure how these devices can contribute to learning. And if they contribute to learning, educators do not know or understand how learning takes place when learners use these devices. The future debate will discuss the paradigm shift in technology, teaching, learning and instructional design. However, there are vast differences between traditional and classical learning methods and modern ones. The changes are social and deal with lifestyle and the time for social interacting, and communication needs. In other words, there is a movement from interactive learning to spontaneous learning.

The terminology comparisons between e-learning and m-learning are presented in the following table (Cobcroft, 2006:14).

Table 2.3: Terminology comparison between e-learning and m-learning (Adapted from Cobcroft, 2006:14)

E-learning	M-learning
Computer	Mobile
Bandwidth	GPRS, G3, Bluetooth
Multimedia	Objects
Interactive	Spontaneous
Hyperlinked	Connected
Collaborative	Networked
Media-rich	Lightweight
Distance learning	Situated learning
More formal	Informal
Simulated situation	Realistic situation
Hyperlearning	Constructivism, situationism, collaborative

From the table above, it is clear that the e-learning space is more constrained by location, and that the m-learning space is more concerned with movement, situated instruction and learning, because the size of mobile devices is small compared with computers. The fundamental difference is that learning with computers in Higher Education is more formal, while learning with mobile technologies is more informal. Nevertheless, e-learning occurs in classrooms, lecture halls and computer laboratories and even at home, while m-learning takes place in open areas anytime and everywhere. Education has traditionally been conducted face-to-face, with students going to where the teacher resides or works. Sometimes this involved peripatetic teachers, or even schools mobilising and travelling to where the students were located. However, this only occurred in extremely large and sparsely populated countries (Jarvis, Holford & Griffin, 2003:11).

With the development of electronic forms of communication and the World-Wide Web (WWW), people rapidly experience the growth of e-learning and virtual universities as a result of mobility. New learning spaces are being created. Learning space is an abstract concept, which has not been adequately defined. While e-learning and m-learning represent considerable potential for the future, few experts think that they will take over the learning market. Learners still seek face-to-face educational opportunities (Jarvis, Holford & Griffin, 2003:12).

Most theories of pedagogy (as distinct from theories of learning) fail to capture the distinctiveness of mobile learning. To investigate these statements, it is necessary to be aware of what is happening with regard to the paradigm shift in education, and the growth of institutions, learning, instruction, learning with technology, educational methods and tools that have evolved over time, as more and more people seek

education and life skills. People's social lifestyles now demand more effective learning in the real world, in order to better understand their universe.

2.2.9 Categories of mobile learning

Combinations of various wireless mobile computing technologies are resulting in increasing transformation of the educational world. Learners are becoming digital and nomadic. Digital, wireless technologies are transforming the learning environments and university campus lifestyles. Liberal, vocational and human resource development in institutionalised education has become more market oriented, so more courses have become vocationally oriented, especially the new degree courses and, in particular, postgraduate degree work, which can be regarded as vocational and even as human resource development. Some educational "shift pressures are specific to Higher Education. Global, social, and technological factors impact Higher Education, but research specific to teaching and learning provides greater direction for how the process of learning should best be facilitated" (Jarvis, Holford & Griffin, 2003:15).

Mobile devices make learning portable, spontaneous, and personal. People can hold these devices in one hand or slip them into their pockets. Elearning might simply become m-learning without any major changes in content (Nyíri, 2002). Some writers claim that though the literature shows that there are changes of learning practice using mobile devices, the learning theories are still old and classic (Traxler, 2007). Traxler (2007) categorises mobile learning by evaluating a number of international case studies and pilot studies as follows:

- **Technology-driven mobile learning** – *Some specific technological innovation is deployed in an academic setting to demonstrate technical feasibility and pedagogic possibility.*
- **Miniature but portable e-learning** – *Mobile, wireless, and handheld technologies are used to re-enact approaches and solutions already used in 'conventional' e-learning, perhaps porting some e-learning technology such as a Virtual Learning Environment (VLE) to these technologies or perhaps merely using mobile technologies as flexible replacements for static desktop technologies.*
- **Connected classroom learning** – *The same technologies are used in classroom settings to support collaborative learning, perhaps connected to other classroom technologies such as interactive whiteboards.*

- **Informal, personalised, situated mobile learning** – The same technologies are enhanced with additional functionality, for example location-awareness or video-capture, and deployed to deliver educational experiences that would otherwise be difficult or impossible.
- **Mobile training/performance support** – The technologies are used to improve the productivity and efficiency of mobile workers by delivering information and support just-in-time and in context for their immediate priorities.
- **Remote/rural/development mobile learning** – The technologies are used to address environmental and infrastructural challenges to delivering and supporting education where 'conventional' e-learning technologies would fail; often troubling accepted developmental or evolutionary paradigms (Traxler, 2007:3-4).

With these categories of mobile learning, one can address the value of using mobile devices in teaching and learning both in and outside classroom. Traxler (2007) postulates principles and rules of using the technology for new educational aspects. To describe mobile learning, one has to consider a considerable number of learning theories. Learning is a change in behaviour and understanding (Smith, 1999). These changes frequently take place in lecture halls and classrooms, in institutions and on university campuses. However, there are no existing theories about how these changes take place elsewhere. Informal learning often happens outside closed rooms. Hence the benefits of mobile and wireless devices, which have the potential to 'break down' walls, and allow learning to take place on the city streets, and as learners move around. The claims of the efficacy of mobile learning extend beyond the current era of mobile devices, and similar claims were made about radio in previous years. Therefore, some relevant theories may perhaps be revised to understand how people learn with mobile technology.

Traxler (2007) examines mobile learning in a wider context, recognising that mobile, personal, and wireless devices are now radically transforming societal notions of discourse and knowledge. They are responsible for new forms of art, employment, language, commerce, deprivation, and crime, as well as learning. With increased access to information and knowledge, anywhere, anytime, the role of education, perhaps especially formal education, is challenged and the relationships between education, society, and technology are more dynamic than ever before.

Mobile technologies work in social life as well as in educational institutions. But what is the relationship between using mobile technologies in within and outside of academic life? In the current landscape of technology-enhanced pedagogical approaches, theory and practice can work together to design and expand learning spaces. In addition, what learning space means, and what the design of learning space in the era of educational change should be considered. Van Hooft and Vahey (2007) categorise highly mobile computing in Higher Education as follows:

- *Highly mobility (that is, small enough that students can hold the device in one hand and carry it from place to place).*
- *Small footprint (so that they do not intrude in face-to-face interactions).*
- *The computational and display capabilities to view, collect, or otherwise use representations and/or large amount of data.*
- *The ability to support collaboration and/or data sharing (Van Hooft & Vahey, 2007).*

Furthermore, the training of people in the Higher Education landscape and their future career needs consideration. An increasing number of people are working outside the office and will require just-in-time training wherever they are located (Ally, 2005:5).

In light of that, there are some gaps in mobile awareness that need to be addressed to contribute to the theory of learning; to understand how people learn with mobile devices in Higher Education. One could explore the way learners use mobile devices to optimise the learning possibilities of such devices. The main theme of the international mobile learning conference, MLearn, which took place in 2004, was 'learning anytime and everywhere' (Attewell & Savill-Smith, 2005). However, the literature of learning theory does not show how this learning occurs. In education and training, the previous functions of education have not disappeared, although education has become more geared to labour-market needs.

Traditionally, however, educationalists argued that education is fundamentally cognitive whilst training is skills based. Although these arguments were convincing to many at the time, they failed to recognise the nature of knowledge and action. Now perhaps, the pendulum has swung a little too far away from cognitive education. Even so, as it is necessary to combine these phenomena, a new term had to be chosen – and it is 'm-learning'. This, however, produces an ambiguous situation since learning has traditionally been viewed as an individual process, and education and training were both institutional ones. Consequently, we now see a separation of formal, non-formal

and informal situations within which learning occurs. Now the focus is upon learning. Providers of learning materials no longer have to be educators, or even know how to facilitate learning (Jarvis, Holford & Griffin, 2003:4-5).

Cronjé (2007) points out that literature in this field shows that mobile learning has become ubiquitous in the context of teaching and learning, perhaps signalling the end of the road for e-learning: "as the term e-learning is losing its popularity in favour of the next set of buzz words – ubiquitous learning, mobile learning, blended learning – it may be necessary to consider why the concept lost its flavour and also to consider if there is life beyond the death of e-learning" Cronjé (2007:1).

For many years now research on the evolution of mobile learning has shown the extent to which mobile devices are reshaping teaching and learning:

- *Over 50 percent of all employees spend up to half of their time outside the office.*
- *More than 75 percent of all Internet viewing will be carried out on wireless platforms by 2002.*
- *Mobile devices will outnumber landline PCs by 2002 and exceed the 1 billion mark the following year.*
- *More than 525 million web-enabled phones will be shipped by 2003.*
- *Worldwide mobile commerce markets will reach \$200 billion by 2004.*
- *There will be more than 1 billion wireless Internet subscribers worldwide by 2005 (Keegan, 2002:13-14).*

Although these statistics reflect the situation before 2002, it is evident that mobile technologies have been growing faster than ever before. The growth in mobile learning as a part of educational technology is indicative of the movement from an industrial age to an information age. The shift from e-learning to mobile learning (m-learning) is marked by the shift from computers to mobile devices. M-learning has led to the emergence of new teaching and learning methods which are more fashionable and responsive to different social lifestyles. Learning has therefore evolved from distance learning (d-learning) through electronic learning (e-learning) to mobile learning (m-learning). The three stages of development illustrate how the Industrial Revolution in the 18th to 19th centuries, the Electronic Revolution in the 1980s and the Wireless Revolution in the last years of the 20th century have influenced human society (Keegan, 2002:10). For example, "the industrial mode of production was successful in inventing 'education' as a new paradigm, institutionalising it in schools,

and implementing it through a number of tools such as 'certified' teachers, curricula, and textbooks" (Albirini, 2007:227).

Table 2.4: Key markers that distinguish industrial-age and information-age organisations (Adapted from Reigeluth, 1996:17)

Industrial age	Information age	This study
Standardisation	Customisation	Integration
Bureaucratic organisation	Team-based organisation	Individual in social organisation
Centralised control	Autonomy with accountability	Distributed
Adversarial relations	Cooperative relations	Co-opetition, social interaction
Autocratic decision making	Shared decision making	Crowdsourcing
Compliance	Initiative	Loose, spontaneous
Conformity	Diversity	Mobility
One-way communication	Networking	Mobility communication
Compartmentalisation	Holism	Pervasive
Parts oriented	Process oriented	Integration oriented
Planned obsolescence	Total quality	Flowing
CEO or boss as 'king'	Customer as 'king'	Owner as 'king'

The increasing numbers of people in need of learning and just-in-time training means that there is a need for high quality teaching and learning. These issues will allow education to develop many innovative aspects of learning systems, methodologies and approaches suitable for distance learning, electronic learning and mobile learning. Technology consists of practical and theoretical meaning. Responses and feedback from people could encourage learners to apply what they learn to their studies and jobs (Ramli, Ismail & Idrus, 2010:34). Technology's practical purpose is supporting and enhancing learning, but the theoretical and philosophical concepts of technology use is still unclear in this age of increasing mobile technology and information mobility.

Traxler (2007:5) indicates that the literature of mobile learning is awash with words such as 'personal', 'spontaneous', 'opportunistic', 'informal', 'pervasive', 'situated', 'private', 'context-aware', 'bite-sized' and 'portable'. This is in contrast to words from the literature of conversational or 'tethered' e-learning such as 'structured', 'media-rich', 'broadband', 'interactive', 'intelligent', and 'usable'. These lists inadvertently blur the distinction between mobile learning and e-learning. But this is not without some challenges. According to Burbules (2000:279) "educational theories have presented its practitioners with a set of challenges that keep resurfacing, in different contexts, and sometimes under different guises". For Burbules, these challenges can be

blamed on the way different disciplines are configured and how these configurations impact on learning. This resulted in an investigation that sought to clarify mobile learning concepts and enhance the understanding of mobile learning.

From this, there is a development from traditional classroom learning to distance learning, e-learning, and mobile learning. However, the growth of educational technology has changed the teaching and learning process significantly (Keegan, 2002). This development provides space to research the differences between classroom learning, e-learning and mobile learning. "The conceptualisation of mobile learning in terms of the learner's experience emphasises mobility, ownership, informality and a context that will always be inaccessible to conversational 'tethered' e-learning" (Traxler, 2007:5).

There is a necessity for an investigation into, and reflections on, the mobility that is present when moving from e-learning media and approaches in the context of mobile learning technologies in Higher Education. This is an implication of theoretical characteristics that surrounded mobile learning among its integration with other learning media and approaches. Theorists and philosophers have advanced many learning theories over time, particularly in the current era. A number of these theories concentrate on the learning that occurs in classrooms and lecture halls mediated by teachers and classroom instruments. Most of the traditional learning theories describe learning that takes place in closed areas. There is no contemporary theory learning that takes place outside the classroom walls in the modern era.

Mobile learning technologies are part of portable lifestyles in most contemporary societies. For this reason, learning with mobile technologies will take place in many places in and outside classrooms. The challenge for mobile learning in Higher Education is to what extent it has an impact as formal learning (Traxler, 2007). The research categorises available modern learning and instructional design theories.

Section 2

THE THEORETICAL POSITION OF MOBILE LEARNING: RESONANCE TO LEARNING AND INSTRUCTIONAL DESIGN THEORIES

2.1 Introduction

This section deals with the underlying characteristics of learning and instructional design literature that may help to explore the position of mobile learning in Higher Education. Theoretical and philosophical contributions illuminate mobility changes in Higher Education. However, there is a large amount of literature in the field of emerging mobile technologies. Therefore, this section discusses various processes and perspectives characteristic of the literature of learning and instructional design theorists. By showing how they build their theories, it aims to provide a comprehensive theoretical picture of mobile learning.

2.2 Traditional characteristics of learning

Philosophical and theoretical thinking in education developed, basically, from the thinking of the ancient Greeks, particularly the eminent philosophers Socrates (dialogue theory) and Plato (indoctrination theory).

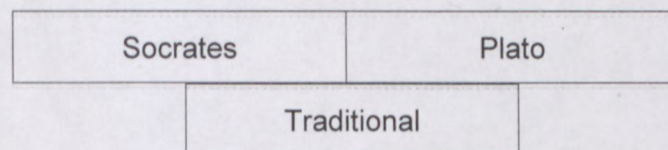


Figure 2.1: Traditional characteristics of learning

2.2.1 Socrates (c. 470 – 399 B. C. E.)

Socrates taught logic as a means of achieving self-centred ends, and promoted the idea that all things are relative (Boeree, 2000:3). People sometimes confuse feelings with knowledge.

The relationship between mobile learning and Socrates' theory is that in mobile learning people do not need to be reminded about what they already know. They can be encouraged to learn by critically questioning something new and applying what has been learnt in real life in mobile learning context. Nevertheless, one of the main weapons was the method of elenchus, or cross-examination, known as the Socratic

method, which consisted of asking questions and bringing out the hidden confusion and absurdities of people's positions, rather than teaching (King, 2006:23). According to Socrates, things are relative.

This section is based on how most of the learning theories relate to each other and, specifically, to Socrates and Plato's theories. Discussing how theories are relevant is done in terms of questioning methodologically the state of design of learning and learning theory.

2.2.2 Plato (c. 428 – 348 B. C. E.)

The debates around the use of mobile learning as tools of teaching and learning form part of a long line of debates surrounding education that goes as far back as ancient Greece. Socrates' student Plato described learning as indoctrination. He argued that philosophy is the only route to genuine knowledge, so the philosophers should rule the state (King, 2006:24).

Platonic thought started the institutionalisation of knowledge and learning by means of indoctrination. His view was that learning occurs in a small place with one class and one teacher. Students of various ages come together to study a variety of subjects such as mathematics, astronomy, law, and, of course, philosophy, based on an apprenticeship approach. Plato describes reality as the 'Theory of Forms'. Forms and ideas are the highest form of reality, eternal and spiritual. Plato studied the occurrence of phenomena, which are signs of the ideal. Phenomena are occurrences that are linked with substance, time, and space, they are perceived by people and demand further investigation (Boeree, 2000:4-5).

Plato argues that, "knowledge can only be of eternal and unchanging truths. Of everyday, temporary matters, we can have true belief (and very useful they can be) but not knowledge. Genuine knowledge isn't learned, but recollected; our souls go through a cycle of reincarnation, but birth is so traumatic that it makes us forget everything we know, and the teacher's task is to help us to regain that knowledge" (King, 2006:25). Dialogue and indoctrination were teaching methods, and memorising what had been taught was a learning method. The methods were based on reward and punishment. If students succeeded, they were rewarded, but if they failed, a punishment awaited (Boeree, 2000:5).

The argument here for mobile learning is that, theoretically, dialogue and indoctrination were found to be inadequate as education methods, because of the

need for other subjects, knowledge, skills, and information that learners acquire. They should also transfer their learning to a social context. There is a need for education that reduces the learners' stress about failure, not indoctrination. Moreover, there is a need for education that can lead to higher degrees, deeper understanding, skills, changes in learners' behaviour, and social leaderships, which can be transferred to the real world without discrimination. These are now recognised as being essential characteristics of effective educational learning theories. Although dialogue and indoctrination approaches have a long history, they are still evident as current alternative theories of education in world institutions in the modern era.

2.3 Modern characteristics of learning

In the modern era, concerns became focused on the relationship of educational leaders to the actual practices of teachers in the real world of the schools. Some writers believe that the teacher's duty is to be certain that students develop a social outlook compatible with a new social order (Violas, 1971:25). The challenge of the 21st century "will be to create a science of human strength whose mission will be to understand and learn how to foster these virtues in young people" (Seligman & Csikszentmihalyi, 2000:7).

Sears and Hughes (2006:3) state that citizenship education has long been associated with a struggle between ideas of 'indoctrination' and ideas of 'education'. The classical approach needed the uncritical acceptance of doctrine without regard to evidence (indoctrination) whereas today more we want to assess possibilities in the light of evidence (education). Today the emphasis is on a long-term perspective for learning motivation. Seligman and Csikszentmihalyi (2000:5) state that, "the exclusive focus on hope, wisdom, creativity, future mindedness, courage, spirituality, responsibility, and perseverance are ignored or explained as transformations of more authentic negative impulses".

This quotation argues for a viable theory of learning which can resist the ever-changing educational demands. And this type of theory may possibly emerge out of profound imaginative and critical thinking.

The 'modern' period needs some clarification and for Jarvis, Holford, & Griffin, (2003:15), the "modern' period usually refers to the period beginning with 'Enlightenment' in the 18th-century, Europe through the Industrial Revolution and beginnings of nation-state until nearly the end of the 20th-century".

In my opinion, above-mentioned statement does go well even in the modern era, Higher Education research is all about digital devices such as computer technologies for teaching, instructing and learning as in electronic learning (e-learning). E-learning includes many educational practices of teaching, instructing and learning as an open-ended learning environment and virtual reality. However, these do not include many theoretical and intellectual frameworks in terms of up-and-coming mobile technologies.

In fact, higher academic institutions have supported deliberately teaching and learning styles to their entirety. Yet, institutions strive to bring popular mobile technologies into good educational practice as social devices for formal teaching and learning purposes. Nevertheless, good research on educational practice has no significant influence without an initial understanding of the literature in the field of futures prevailing. These developments of human social life have resulted in moving traditional lifestyles to modern ones and their associated gadgets.

The Renaissance in Europe saw the rebirth of classical forms of literature and scholarship after the so-called Dark Ages. The Enlightenment ushered in profound social change connected with science, humanism and individualism. In due course, the kind of societies called 'modern' emerged, based upon rationality, freedom and progress. Political systems and new social orders display the comparison between nature of technologies and human lives. That progress, which was influenced by industrial development, led to the mobile learning era, described as the era where actual practice was such that the school system - from the elementary grades through to the university faculties.

Through my critical observations, the historical assumptions that may be expected in Higher Education until future mobile technologies push and become more prominent. The social learning that occurs in the real world in the modern era becomes integrated with the learning that takes a formal place in Higher Educational institutions discussing rationally the mobility that forces change in modern society and reflect upon modern education from the context of mobility and learning.

2.4 Categories of modern learning and instructional design theories

Over the course of time, education and its tools changed dramatically as more people wanted education and life skills. People required more education to understand their universe. The result, as seen by Sharples, Taylor, & Vavoula, (2007) is that many learning theories date back over "the 2500 years between Confucius and the present

day, but almost all have been predicated on the assumption that learning occurs in a school's classroom, mediated by a trained teacher". In the age of technology, these theories may be obsolete but they provide a fascinating departure point for the development of modern theories of learning.

Meanwhile, for the purpose of clustering and categorising learning theories, Mayes and de Freitas (2004b), specify three broad main clusters of modern learning theories to understand how people learn. This is captured in table 2:5 below.

Table 2.5: Three categorises of learning theories (based loosely on Mayes and de Freitas (2004b)

	Associative	Constructive		Situated
		(Individual)	(Social)	
Learning understood as:	Building concepts or competences step-by-step	Achieving understanding through active discovery	Achieving understanding through dialogue & collaboration	Developing practice in a particular community
Key theorists	Skinner, Gagné (Instructivism and Instructional Design)	Piaget, Papert, Kolb	Vygotsky (Social Development)	Lave and Wenger (Communities of Practice), Cole, Engeström and Wertsch (Activity theory)

In reviewing theories, frameworks and models in the fields of e-learning, Kukulska-Hulme and Traxler (2005b) have drawn together the main characteristics of associative, constructive and situated learning theories:

- *The associationist perspective emphasises behavioural change, expressed through goals, progressive sequence and accurate reproduction or performance.*
- *The constructive view has many different pedagogical manifestations, ranging from co-instruction with learners, knowledge construction through active participation, social construction of knowledge through group work, to applied, problem-based learning.*
- *The situated view encompasses apprenticeship, coaching and learning from real world setting (Kukulska-Hulme & Traxler, 2005b:28).*

The three learning approaches of associative, constructive and situated learning seek to clarify how learning takes place when learners use mobile devices in the Higher

Educational community. One must consider how else Higher Education should design and increase its learning spaces. The learning theory of mobile learning might be revised with regards to associative (learning as activity), constructive (learning as achieving understanding) and situated (learning as a social practice) learning theories. The rationale is the three broad clusters of associative, constructive and situated learning theories, as theorists are still familiar with the psychological characteristics of learning theories related to e-learning, but they may not have been related to the use of mobile learning technologies until now in terms of mobility. Nevertheless, one has to draw on these characteristics of the theories. Therefore, it would be wise for this research to expand the cluster in the context of mobile learning that takes place anytime and everywhere. Emerging technologies have extensive effects on how teachers teach and how learners learn in Higher Education. The rationale is that educational theories show that technologies enhance and support learning in developing countries as mobile devices has a lower cost than computer devices. In other words, for every personal computer in a developing country there are roughly four mobile phones (Banks, 2008:52).

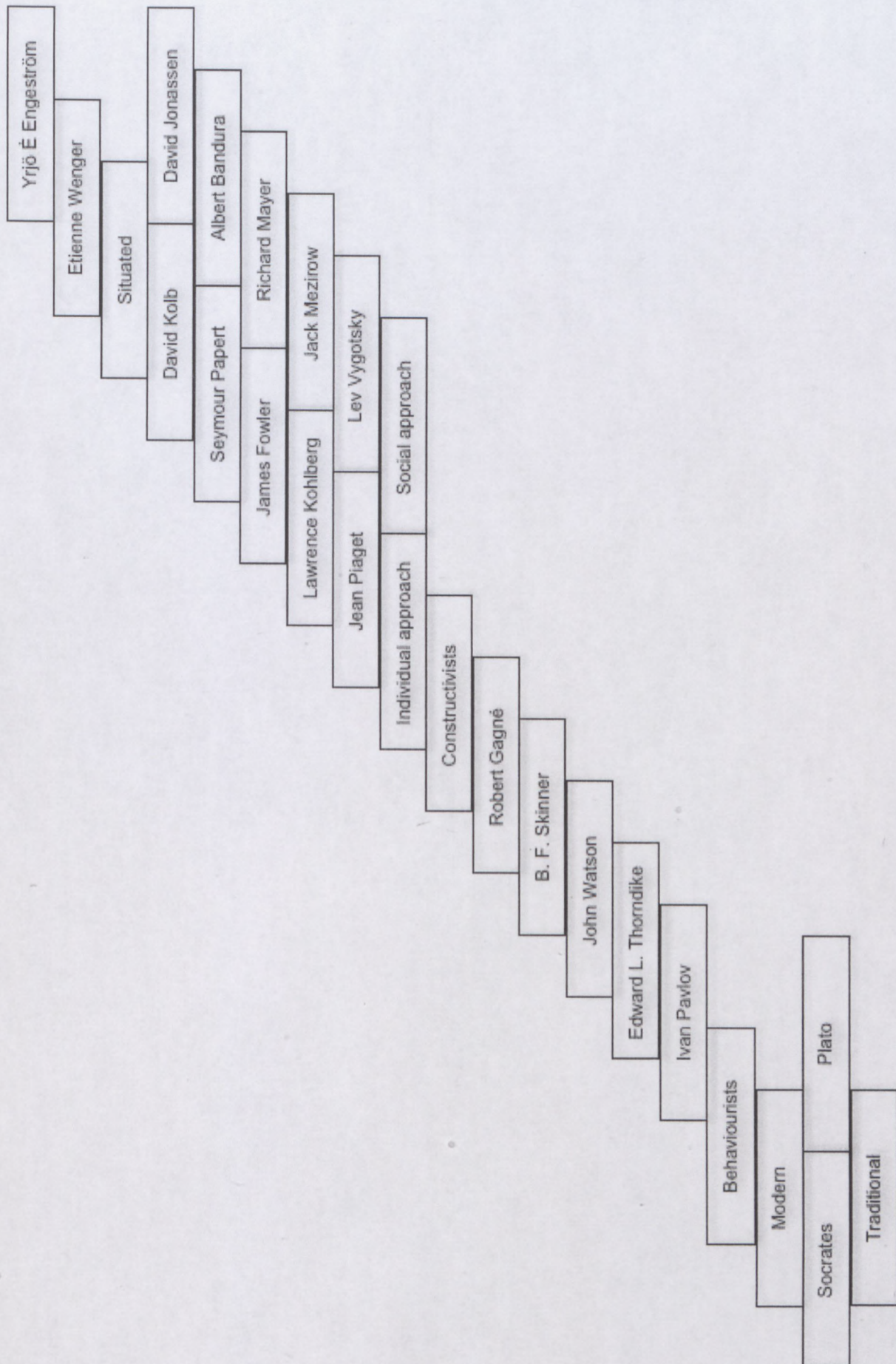


Figure 2.2: Learning and instructional design theorists

The shift from the digital age to the mobile age requires thinking about a theory relevant to the mobile age. In addition, when learners are moving from the digital age to the mobile age, natural changes occur because of their needs and their capacity to learn. The theoretical challenge is that educators and learners practice to form and develop a creative Higher Education community when they teach or learn with mobile devices and they should research intellectual thinking more than just researching good educational practice. What I could get from the notion of Hoppe (2007:35) is that the vitality of being creative in designing, developing and deploying is the main ingredient in understanding the social aspects of mobile learning.

Eventually, the strategies applied in practices demonstrate that no single theory adequately stands for mobile learning. This section reflects upon the underlying theories, characters and themes that may help to theorise mobile learning. In addition, using educational technology theory, the researcher adopted and upgraded these clusters by including the theorists contributing to the new wave of learning and technology, namely, instructional design theory. The rationale is that learning theory can get through the matrix of rules for the various cases that would be part of the grand theory of instruction. Accumulative research can identify which strategies are applicable under different conditions, in order to best facilitate learning. Grounded learning systems are the systematic implementation or processes and procedures that are rooted in established theory and research into human learning. As a result, recommended research should concentrate on the modern learning and instructional design theories that need to be revised to explain the changes in the context of mobile learning. Moreover, to understand the position of mobile learning in the Higher Education landscape, understanding the combinations of technology, learner and learning that go into mobility is a priority.

The theories discussed in this section show that all the modern theories relate back to Socrates and Plato's theories. The theories resonate forwards and backwards, that is they 'unpack' themselves. However, each theorist builds his/her own theory on the previous ones as no theory can be built on nothing, or can stand-alone. Theories build on the work of others and reflect one another.

2.5 The implications of associative paradigms for mobile learning

The associative approach to learning, namely, behaviourist theory, requires subject matter to be analysed in term of specific associations, and expressed as behavioural objectives that function to serve a society. The role element of behaviourism is "stimulus and response", that learner acquires learning and knowledge, would interact

associatively with the learning activities during learning. Mayes and de Freitas (2004b) describe the conditions linked with the learning theory of association as people learn by association, initially through basic stimulus-response conditioning, later by associating concepts in a chain of reasoning, or associating steps in a chain of activity to build a composite skill. The notion of a chain of reasoning relates to the imaginary connections between people with the same frame of reference and how these connections influence the way learn and construct meaning.

From these statements, the psychological thought adds to theory of learning as a behaviour change. It took, as at that time a debate over how to describe and explain the human mind and behaviour began. It went deeper than attempting to explain how the human mind works, as some stages of research did.

The Enlightenment was a European intellectual movement of the late 17th and 18th centuries emphasising reason and individualism rather than tradition. Philosophers such as Descartes, Locke, and Newton heavily influenced it, and its prominent exponents include Kant, Goethe, Voltaire, and Rousseau. The behaviourist approach to learning is one of the most well known of approaches in the field of teaching and learning. It stems from the experimental work of Ivan Pavlov and B. F Skinner, although there are other influential behaviourists. One asks how the behaviourists' theory of stimulus–response describes mobile learning. The claim is that any device can lead to a stimulus–response condition. What do individual learning and the collaborative role of mobility mean in terms of learning with a stimulus–response condition in the mobile learning context? My strong belief is that mobile learning, whether it is on individual or collaborative basis, definitely has not only given high standard lifestyles but also got them awareness in learning the devices proficiently enhancing their hidden capabilities unknown. Referring to the statement of Attewell and Savill-Smith (2005:13-15), that to some extent stand by my above presented belief, is that the use of mobile devices increases the literary skills to satisfactory level that ensures the victory even to their clumsy learners.

2.5.1 Ivan Pavlov (1849 –1936)

Pavlov was one of the pioneers of associative conditioning theory thought, and it is his work with dogs that is most widely known. Dogs salivate at the sight of food. Pavlov's research showed that if a buzzer sounded just before the dogs were given food and the two were associated in this way a number of times, the dogs salivated at the sound of the buzzer even before the food appeared. Therefore, it can be claimed

that the dogs learnt to salivate at the sound of the buzzer (Jarvis, Holford & Griffin, 2003:26).

Table 2.6: Stimulus and response items of Pavlov's experiments
(Adapted from Mergel, 1998:4)

Food	Unconditioned stimulus
Salivation	Unconditioned response (natural, not learned)
Bell	Conditioned stimulus
Salivation	Conditioned response (to bell)

Pavlov's research with dogs aimed to describe the functioning of the conditioned reflexes arising from the dogs, food and the buzzer sound association leading to salivation. This, as he showed for dogs, is a learnt activity.

After my going through then reviewing the literature on mobile learning, I came to know that some theories were based on Pavlov's work on classical conditioning. Naismith, Lonsdale, Vavoula and Sharples (2004:10-11) indicate that within the behaviourist paradigm, learning is thought to be best facilitated through the reinforcement of an association between a particular stimulus and a response. Applying this to mobile learning, the presentation of a problem (stimulus) is followed by a contribution from the learner to the solution (response). Feedback from the mobile system then provides the reinforcement. This type of learning adopts a transmission model – learning takes place through the transmission of information from the tutor (the mobile learning system) to the learner. For more connection, the mobile learning system provides the learner with learning tasks such as multiple-choice questions (stimulus) and the learner chooses the correct answer (response). Therefore, the claim is that any device can do stimulus–response conditioning, but how can the mobile device be integrated with the stimulus–response conditioning in the mobility of individual and social interaction conditioning?

Pavlov's theory is not applicable to most aspects of mobile learning in terms of current learning mobility, and also not aligned with with a theory of mobile learning that may move away from just stimulus and response to break down the boundaries of learning as a whole.

2.5.2 Edward L. Thorndike (1874 – 1949)

When Pavlov was working in Russia (the end of the 19th century), Thorndike was working with cats and their response to food in America. He put a cat into a cat box that had a lever to open the door, and placed food just beyond the cat's reach, though the cat could see the food through the bars. As the cat struggled to reach the food, it eventually accidentally pressed the lever and the door opened. When the experiment was repeated, Thorndike discovered that the cat gradually learnt to associate the lever with opening the box, and it got to the food more quickly (Jarvis, Holford & Griffin, 2003:26). Even if Thorndike's research is experimental, it is hard to claim that animal intelligence heredity have influences any part of associative learning. There is an interdependent relationship between a certain situation and resultant pleasure, and the general type of association is found throughout the animal's life normally. The muscular movements required are all similar to what the animal uses normally, but the required acts are near enough to the acts of the animals to enable one to compare the results of the experiment. (Thorndike, 1998:1127).

It is obvious from Thorndike's statement that he built his learning theory according to assumptions about how the cat's mind worked. Extending his work to humans, he established that mature and competent minds improved so much as a result of a short training course that they were able to do a task in two-fifths of the initial time.

In applying Thorndike's theory to mobile learning, it is clear that most mobile learning systems are based on the assumption that the learning object – mobile technology – functions as conditioned stimuli and the learner's response (followed by the mobile system) functions as feedback. However, learning takes place as sudden events or without the learner really deciding to learn, and it can be claimed that mobile learning and the use of mobile technology and mobility is spontaneous.

Criticism of Thorndike's work is that it does not fit the context between animals and human learning as they are in different contexts. However, animal learning is not necessarily applicable to human learning. And if it is, can it be measured how animals, mobile learning, or human learning functions in this context? Thorndike's result shows that the basic components of his research hypothesis are not measurable, as he revised his research: "comparable units for the measurement of mental achievement are so often lacking" (Thorndike, 1908:384). Undoubtedly, this is essence of getting to complexities of the mentality, which is sometimes beyond the understanding of the approaches practised.

Thorndike's work shows early experiments with the type of trial and error learning that goes on in everyday life, especially when seeking to solve problems. This appears in mobile technology in education learning methods as trial and error; drills and practice; and games and tutorials. However, mobile technology is richer than personal computer technology, as it does more than solving problems, mobile activities are to search problem.

Thorndike's contribution, to the presence of the learning theory through the implication of his proposed research into trial and error in his life span when there was no sign of the mobile technology, is worth aspiring. In order to understand the connection between Pavlov and Thorndike's theory and mobile learning, Naismith, Lonsdale, Vavoula and Sharples (2004:10-11) give an example of drill and feedback activities. They allow teachers to:

- *Present content-specific questions; these questions can range from simple review to probing questions at the heart of the subject matter. Suggested solutions are invited by way of multiple-choice options on the students' devices.*
- *Gather student responses rapidly and anonymously.*
- *Quickly assemble a public, aggregate display to show the variation in the group's ideas while maintaining individual anonymity.*

This connection explains trial and error as a mobile learning system. In multiple-choice questions given to learners in a mobile system, the student will try to answer. If he/she chooses the wrong answer the mobile learning system will give immediate feedback that he is wrong and he/she should try again. The learner should answer again until he/she finds the correct answer. Then the system will give feedback that he/she is right and he/she should move on to the next question. The underlying principle is simple, but there appear to be a number of advantages over traditional methods of classroom interaction (Naismith, Lonsdale, Vavoula and Sharples, 2004:11).

Design of this type of learning is based on trial and error that requires repetition of the task until the learner gets it right. However, it does not explain how learning can be transferred beyond closed areas and beyond stimulus and response conditions.

2.5.3 John Watson (1878 – 1958)

Watson suggests that the more frequently a stimulus and response are associated, the stronger the habit will become. Pavlov asserted that the response that occurs soonest after a stimulus is the one most likely to be associated with it (Jarvis, Holford & Griffin, 2003:26). Watson's early research continued Pavlov's work in connectionism of 'associative memory'. This has implications for mobile learning as instinctive activity that is prompted by apparently unconscious or automatic behaviour, while the diffuse activity is prompted to spread over a wide area or among a large number of people as consciousness behaviour. The supposed intuitive faculty giving awareness is not explicable in terms of normal perception.

Keegan (2002) observes that not all teaching is suited to the m-learning environment, where a preference be given to short courses and theory- and information-based classes. Cobcroft, Towers, Smith and Bruns (2006:62) argue that the most authentic recourse best use of mobile learning depends on exploiting social interpersonal factors that might make the job more convenient. Watson demonstrates these relationships in the following statement: "Theoretical limitation of the behaviour method cannot be triumphed over entirely as it will be stagnant" (1913:47).

While there is no explanation of how the experiential learning research led to understanding the context of learning socially, it explains part of mobile learning individually but it is not adequate to explain mobile learning activities and context. It is not always wise to transfer the results of the experiments of behaviourists to humans, since they were conducted with animals and with tools that might not be suitable for humans. Watson's comparison of human and animal cognition breaks down when one considers mathematical logic, which is not dependent on visible cause and effect. (Jarvis, Holford & Griffin, 2003).

2.5.4 B. F. Skinner (1904 – 1990)

Skinner is the most important American psychologist of the twentieth century, and arguably the most important world psychologist. He continued the behaviourists' research into the theory of behavioural stimulus-response conditional approach. His work is more related to educational technology and teachings tools as Skinner assumed that machines could teach subjects to perform in a required way by means of stimulus and response of associative conditions.

Skinner (1958) explains the teaching machine theory and argues that machines can teach, and that as a result of an experimental study of learning devices, optimal conditions for self-instruction are created. There are more people in the world than ever before and a far greater number of them want an education. Education must become more efficient. He recognised stimulus and response as a basic element of association learning. Teaching machines can be understood as using the technology of audio-visual aids to support teaching. Audio-visual aids can supplement and may even supplant lectures, demonstrations, and textbooks. A machine allows a learner to become more than a mere passive receiver of instruction and self-instruction. The teaching machine works in that a student refers to numbered items in a multiple-choice test. A student presses the button corresponding to his first choice of answer. If he is right, the device moves on to the next item, if he is wrong, the error is tagged, and he/she must continue to make choices until he is right. This remains self-instruction as Skinner (1958:8) states that self-instruction is advantageous even developed institutions because of innovative ways of using machine teaching-style.

This means that machines could not only test and score, they could also teach. By confirming correct responses a self-testing machine does, indeed, teach; but it is not designed primarily for that purpose. For instance, if machines can teach, that means that students can learn. Based on Skinner's first behaviourism theory of stimulus and response, a student is 'taught' in the sense that he is induced to engage in new forms of behaviour and in specific forms, upon occasion, in the school system.

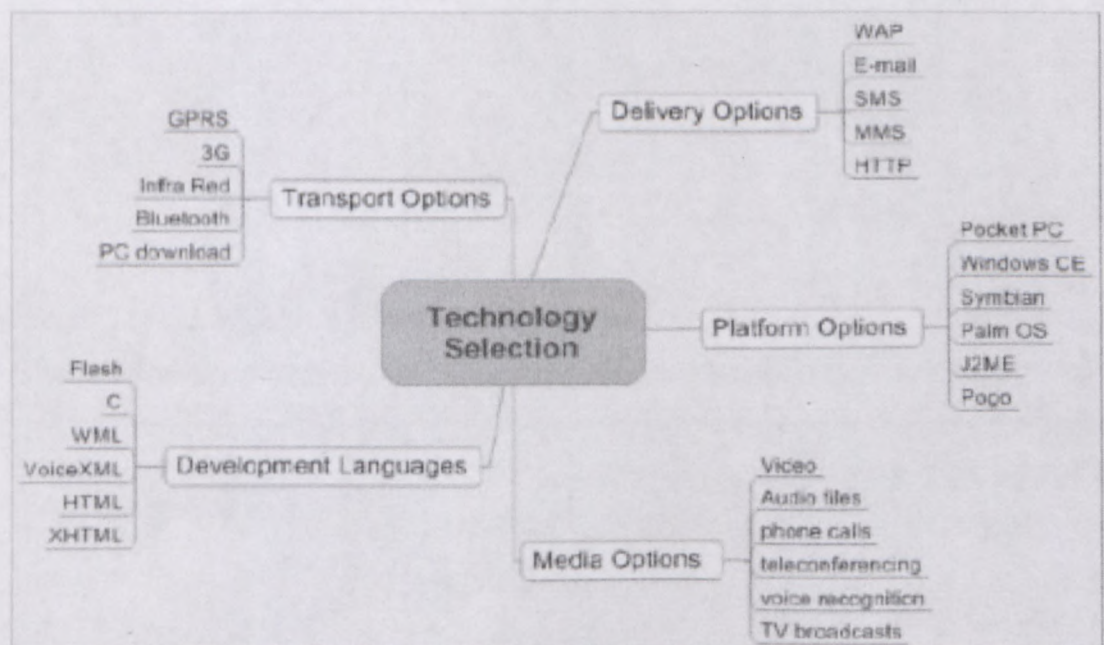


Figure 2.3: Technology selection (Adapted from Attwell, 2005:3)

The above proposed diagram is a comprehensive effort of Attwell, (2005:3) that is appreciated by other four authors: Cobcroft, Towers, Smith & Bruns (2006:53) that it works as an outstanding model for teaching technological theories in the Higher Education that further expands in eight utmost valuable points to be noted as they are all about designed to make the difficult learning problems into easiness for the students. Skinner (1958:9) totally have faith that learning is not only linked to the fully developed and authentic institutions but it can be achieved through diverse community as commonality brings the opportunities for the learners to get to know such things that are assumed to be learned through thoroughly institutionalisation; that's to some satisfactory level is referred by Dewey's (1916) democracy and education.

Democracy is related to the freedom of an individual in society. It includes free communication between society and individuals. However, Nyíri (2002) defines mobile learning, in the light of Dewey's (1916) democracy and education, as learning as it arises in the course of person-to-person mobile communication. Espousing a philosophy of the newly emerging discipline, communication is an anthropological necessity that is further facilitated by the integration of mobile devices into learning.

The argument against Skinner's theory is that learning is interaction between people not between machines; people want to learn from people not from machines. So, it may be possible the teaching/learning with machines? This theory supposes that machines are tools for supporting and enhancing teaching/learning. Educators can use machines to enhance and support learning and should use learners' mobile machines to learn. However, technologies such as machines are tools of our time. Otherwise, learning can take place without machines, because machines do not replace good teaching. However, mobile technology has found increasing acceptance, and hence have proliferated in recent years as they are perceived to be more convenient than traditional PCs and laptops.

With regard to mobile delivery, the research found that mobile learning is facing "challenges similar to those faced by early designers of computer-assisted learning (CAL) systems, when the technology was more limited. Compared to today's desktop computers, mobile devices have limited displays, restricted input methods, and low rates of connectivity" (Naismith, Lonsdale, Vavoula & Sharples, 2004:11).

Mobile devices may not work in the associative context probably because learning with mobile devices is not just conditional upon stimuli and response. Learning with

mobile devices may not appear in measured behaviour. The associative theory does not seem to be an adequate theory for mobile learning. Certain aspects of learning with mobile devices are not observable as they are mental processes. By the same token, mobile technology might not exhibit a driver stimulus–response condition of learning. However, decades of learning behaviour research have demonstrated that classical and operant conditioning principles do not predict all learning outcomes (Alessi & Trollip, 2001:36-37). Therefore, some claim that there is reason for revising these learning theories in the era of digital and wireless technology. However, mobile technologies are far more than just learning devices, they actually affect the learner's unobservable behaviour. In this sense, mobile technologies facilitate more than academic learning; they facilitate non-academic learning outside the confined, observable places.

2.5.5 Robert Gagné (1916 – 2002)

Gagné (1985) suggests that learning tasks for intellectual skills can be organised in a hierarchy according to complexity, stimulus recognition, response generation, procedure followed, the use of terminology, discriminations, concept formation, rule application and problem solving. The primary significance of the hierarchy is to identify prerequisites that should be completed to facilitate learning at each level. Doing task analyses of learning/training tasks identifies it. Learning hierarchies provide a basis for the sequencing of instruction.

Gagné developed his theory of instruction by outlining nine instructional events and corresponding cognitive processes with which his theory investigates the conditions of learning and response. These are:

- *Reception (gaining attention).*
- *Expectancy (informing learners of the objective).*
- *Retrieval (stimulating recall of prior learning).*
- *Selective perception (presenting the stimulus).*
- *Semantic encoding (providing learning guidance).*
- *Responding (eliciting performance).*
- *Reinforcement (providing feedback).*
- *Retrieval (assessing performance).*
- *Generalisation (enhancing retention and transfer) (Gagne, 1985).*

Holzinge, Nischelwitze and Meisenberge (2005), using cell phones as an m-learning platform based on Gagne hierarchies, designed their learning instruction in a platform-independent application that can be used on a variety of different operating systems with mobile phones. A standardised development environment is therefore necessary:

- *Formatted continuous text.*
- *Images integrated with text.*
- *Hyperlinks and elements with specific actions.*
- *Audio and video bars for playback (also streaming from a server is possible).*
- *Interactive questions and intelligent help.*

These may be included:

- *Checkbox questions (single choice, multiple choice).*
- *Order questions.*
- *Inserting characters questions (text match and numbers match).*
- *Graphical order questions.*
- *Graphical marking questions – marking of certain regions (hot spots) within a picture (Holzinge, Nischelwitze & Meisenberge, 2005:3).*

In the analysis of complex tasks in Gagné's learning hierarchies the decomposition hypothesis involves the assumption that smaller units need to be mastered as a prerequisite for more complex units. Thus, in mobile learning, sequences of instruction are designed for students to be able to succeed by learning in small and logically ordered steps. The process of discourse learning takes place during the hypothesis of learning events or the protocol of learners' performances linked with the stimulus of the mobile system. The main element of this approach is the linkage of learner with associative work in the field trip for learning purposes. However, as behaviourist theory learning is thought to be best facilitated through the reinforcement of an association between a particular stimulus and a response, one must apply this to mobile learning. Learner-centred goal setting is also a necessary principle of relational design (Gagne, 1985).

Thomas (2005:4) developed a mobile learning case according to Gagne. The main theme of the case is self learning, which has remarkable advantages as the learner initiates the learning and develops the abilities discovering new methods that not only help them but develop the confidence that encourages a learner to go ahead

constantly. Being freed to adapt any path provides the sense of satisfaction in the learning makes learner vigilant in further exploration-way.

However, mobile technology provides these opportunities of learning and learners are actively free to construct their learning instructions. Nonetheless, the construction of learning is not an observable behaviour as the behaviourists claim. Rather, learning construction takes place cognitively in the learners' minds as the constructivists thought.

2.6 The implications of constructivist paradigms for mobile learning

Pavlov's classical conditioning, as part of behaviourism, together with Thorndike, Watson and particularly Skinner's theories, have been superseded by Jean Piaget's theory. Though their developments have been surpassed, the previous philosophical underpinnings laid the foundation for new paradigms to understand the nature of learning. An analysis was done of aspects of human cognition, behaviour, culture, and experience that focus on relationships of contrast between elements in a conceptual system that reflect patterns underlying a superficial diversity. It indicates that, in contrast to the behaviourists' paradigms, the doctrine of structure is more important than function. Therefore, the constructive approach provides a basis for analysing concepts and procedures of subject matter curricula in terms of information structures, and gives rise to new approaches to pedagogy.

Constructive theories concentrate on advice, criticisms or actions that are positive. They are intended to enhance or improve learning through both individual and collaborative learning. "Learning is understood as achieving understanding through active discovery, dialogue and collaboration (Mayes & de Freitas, 2004b). Good and Brophy (1990:187) states that through contiguity and repetition, learning is recognized with the collaboration of established association as well as the acknowledgement of the reinforcement emphasising on the feedback regarding the accuracy of replies, playing a role of motivator.

Constructivist approaches to learning have emphasised the assumption that understanding is gained through an active process of creating hypotheses and building new forms of understanding through activity. Piaget's assumption that conceptual developments occur through intellectual activity rather than by the absorption of information has been significant. This means that learning takes place when learners individually construct their own knowledge to understand the world. However, the constructivists recognise that learning is something that happens individually and collaboratively.

2.6.1 The implications of a constructivist individual approach to mobile learning

Constructivism theory was built upon two main sections: the individual learning and social learning. These two sections are captured in the following renditions on constructivism from. Mayes & de Freitas (2004b):

- *People learn by actively exploring the world around them, receiving feedback on their actions, and drawing conclusions.*
- *Constructivity leads to integration of concepts and skills into the learner's existing conceptual or competency structures.*
- *Learning can be applied to new contexts and expressed in new ways.*
- *Experimentation or experiential learning, are typical constructive approaches.*
- *Constructive theories are more concerned with how knowledge and skills are internalised than how they are manifest in external behaviour.*
- *As in constructive approaches, attention will be paid to how learning opportunities are presented so as to allow progressive discovery of relevant concepts/skills (Mayes & de Freitas, 2004b:1-4).*

Individualisation aims to “explore the potential for individualised mobile learning – revision material is tailored to the needs of the individual. It also aims to provide learners with a flexible context-awareness system that can react to their needs” (Cobcroft, 2006:8). In mobile learning, students work individually to construct their own tasks such as taking pictures and recording videos and sounds. However, they make their own instructions for learning activity on their own devices. The constructivist theory as an individual approach calls for that mobile learning as self-regulated learning. Mobile devices are in the learners' hands and they employ them in a 'just-for-me' manner. Mobile learning that provides opportunities for connectivity and interaction has the potential to provide learners with a meaningful learning environment and experience; one in which the learning is situated in a real life context. However, “timely and rapid access to practice resources may better support teaching and learning, particularly when practice takes place in the community where the instructor is further removed from the point-of-care, and where opportunities for student-to-student interactions are more limited” (Kenny & Van Neste-Kenny, 2009:84). The issue of better support is critical in ensuring the quality of mobile learning because the 21st century of student is seemingly not responsible enough to

interact meaningfully using different technologies. Very often, these tools are used for play rather than for learning.

A more accurate analysis of constructivist learning as an individual and social approach in the context of mobile learning does not show where and when that learning takes place. However, the learner can use a mobile device as a self-regulation tool in a classroom. Hence, the constructive individual learning approach – as a learning theory – does not postulate learning to transpire in many positions in Higher Education landscape.

2.6.1.1 Jean Piaget (1896 – 1980)

A distinguished theorist Piaget unties the tangled strings relating to the child's cognitive development process exemplifying his daughter. Where children would rather apply such sources and logics that are congenial with their needs and comprehension for learning, that does not mean that interaction with others and things do not affect the process of learning.

Table 2.7: Piaget's stages of cognitive development
(Adapted from Jarvis, Holford, & Griffin, 2003:33)

Period	Age (in years)	Characteristics
Sensory-motor	0-2	Infant learns to differentiate between objects in the external world
Pre-operational thought	2-4	Child ego-centric but classifies objects by single salient feature
Intuitive	4-7	Child thinks in classificatory way but may be unaware of classifications
Concrete operations	7-11	Child able to use logical operations such as reversibility, classification and serialisation
Formal operation	11-15	Trail steps towards abstract conceptualisation occurs

Piaget's theory focuses on the fact that, as children grow older, their ability to conceptualise develops in five stages according to their age. Philosophical principles are informed by the logic that people need not re-invent the wheel – the creators of connections have made it possible for people to share their knowledge, so they can select from the best ideas to create the most effective learning materials (Quist-Adade, 2008:34).

There are a number of criticisms of Piaget's work. His analysis is only of children up to the age of 12, whereas individuals continue to grow and develop cognitively.

Although he did not develop his theory for children of more advanced ages and for adults, Piaget recognised that thought patterns continue to develop (Jarvis, Holford & Griffin, 2003).

Naismith, Lonsdale, Vavoula and Sharples' (2004:12) idea that the use of a cognitive structure to select and transform information, construct hypotheses, and make decisions is heavily based on Piaget's description of the patterns of physical or mental action that underlie specific acts of intelligence and that correspond to the stages of child development. Mobile learning technologies provide a cognitive structure of multi-functions for students using their own thinking to design and learn. Still, learning with mobile technologies requires people to think, design and use their own freedom of creating learning tasks and instructions.

2.6.1.4 Seymour Papert (1928 - *)

The creator of Logo Seymour Papert built on the work of Vygotsky to allow children to learn by constructing actual artefacts using Lego and programming the blocks in Logo. He coined the term Constructionism to refer to this type of constructivist learning approach. Papert (1980:50) argued that children learnt best in the active role of designer and constructor.

Logo, enabled learners to develop mathematical skills by solving geometrical patterns. Papert's contention that children learn by doing can be applied when mobile devices are used as cameras, spreadsheets, or any other *construction tools* with which learners can produce artifacts and learn in the process.

Through my observations, it is clear that usage of mobile has become so easy for even the poor learners and they willingly don't show any hesitation to learn the complicated features provided in the mobile such as YouTube that is not only in mobiles but laptops and iPads. So by learning the usage of You-Tube, they get themselves familiarised with other devices and how to use them successfully with development of the confidence. That is why mobile learning encouraging them to befriend with other technology that may bring a revolution in their life and make the future secure.

2.6.1.5 David A. Kolb (1939 - *)

Kolb (1984) states that learning is most successful when the learners are in control of their own understandings, conducting a continuing cycle of experimentation and reflection. Kolb's learning style research provides a good basis from which to defend

the “field trip” as a learning experience. Mobile devices are particularly suited to field trips.

A field trip is a good example of mobile learning individual approach. Kravcik, Kaibel, Specht & Terrenghi (2004:26) in their research on using mobile technologies during a field trip, argue that “the developments in wireless communication and mobile device technology, the pedagogical demands for cultivating knowledge management skills, and existing difficulties with the organisation of field trips led learners and their partners in the consortium of mobile learning to initiate the RAFT (Remote Accessible Field Trips) system”. Its philosophy is the employment of available technology to produce an integrated and interactive system for linking, in real-time, field trips and classrooms. For them, the integration of mobile learning technologies and the field trip provide learners with authentic information that can be accessed on the move, everywhere and at anytime.

2.6.2 The implication of the constructivist social approach to mobile learning

Mayes and de Freitas (2004a) identify constructive learning as a theoretical social approach because learning is understood as achieving understanding through dialogue and collaboration. They identify a number of aspects of the learning theory of the social constructivism approach:

- *Individual discovery of principles is heavily scaffolded by the social environment.*
- *Peer learners and teachers who play a key role in development engage in dialogue with the learner, developing a shared understanding of the task, and providing feedback on the learner's activities and representations.*
- *Collaborative work is typical.*
- *Emerging concepts and skills are supported by others, enabling learners to reach beyond what they are individually capable of (learning in the ‘zone of proximal development’).*
- *Attention is paid to learners' roles in collaborative activities, as well as the nature of the tasks they undertake (Mayes and de Freitas, 2004b:1-4).*

2.6.2.1 Lev Vygotsky (1896 – 1934)

Vygotsky was a critic of Piaget's work. He suggested that the relationship between a child and reality is missing in Piaget's theory. Vygotsky wanted to discover “the actual relation of the developmental process to learning capabilities” (Jarvis, Holford &

Griffin, 2003). The actual developmental level of a child is the level of the mental functions that have resulted from the developmental cycle that is already complete. Jarvis, Holford and Griffin (2003) state that for Vygotsky, mental age equates to the actual level of development. However, he thought that what children do with the assistance of others might be an even better indication of their mental development than what they achieve by themselves.

Botha, Traxler and Ford (2008:44) describe their project 'MobilED' as is an international collaborative project aimed at creating meaningful learning environments using mobile phone technologies and services. Their socialising, sharing and mediating mobile learning activities resonate with the work of Vygotsky (1962; 2000).

Vygotsky (1978:55) distinguishes between two types of mediating agents in human activity: technical tools and psychological tools. He states that a technical tool's function is to serve as a conductor of human influence to the object of activity. It is externally orientated and it must lead to changes in objects. It is a means by which a human external activity is aimed at mastering, and triumphing over, nature.

The importance of this for mobile learning is that one cannot draw inferences from what individuals do independently. There is a need to see the potential rather than the achievements. Vygotsky suggested that potential could be spotted through teamwork, guidance and coaching. He is clear that different individuals have different sized zones of proximal development and consequently, different potential within that specific context. They can be matured through teaching (Jarvis, Holford & Griffin, 2003). This could be an essential theory for the initialisation of mobile learning that is facilitated by a learner's 'just-for-me' device. However, social interaction is fundamental in cognitive development (Vygotsky, 1978:55). The collaborative classroom and outdoors learning in the mobile learning environment provide opportunities for the social interaction of students. Mobile technology provides social devices that change the way social communications take place.

2.6.2.2 Richard Mayer

- Richard Mayer's (<http://www.psych.ucsb.edu/people/faculty/mayer/index.php>), current research involves the intersection of cognition, instruction, and technology with a special focus on multimedia learning and computer-supported learning. He argues that instructional methods that enable this condition are likely to be effective across media environments. In rejecting a technology-centred approach, he concludes that "media environments do not cause learning; cognitive processing by the learner

causes learning. If an instructional method promotes the same kinds of cognitive processing across different media, then it will result in the same benefits across media" (Mayer, 2003: 137).

Mayer discusses the use of multimedia in teaching and learning as that "the goal of multimedia instructional messages is to foster meaningful learning. Meaningful learning can be assessed through problem-solving transfer tests in which the learner is asked to use the presented material in new ways" (Mayer, 2003:128). Delich, Kelly and McIntosh (2008:5) dig passionately in the soil of technology that can not exempted from the multimedia that is online learning is progressing by leaps and bounds as the availability of the increasing number of new technology tools. E-learning has an unbeatable position in the multimedia competition where the usage of mobile has also evolved and expanded rapidly as they are both interconnected and now hardly are parted from each other. Educators discover more options in making their dreams come true inventing new schemes and practices for the future miracles.

The premise in Mayer's research relates to mobile learning as he argues that "Learning is not just the use of technology; learning is based on the intelligent design of multimedia instructional messages, which depend on an understanding of how the human mind works. The role of instructional technology in this learner-centred scenario is to serve as a tool that increases the power of human cognition" (Mayer, 2003:137). Environments and devices that are tuned into the needs of those using them and which automatically adjust to the situation are considered to be context-aware.

2.6.2.4 David Jonassen

David Jonassen is a second-generation instructional technologist. His work is based on debating the change from behaviourist to constructivist theory. His main argument is that learning media and tools should be taken away from instructors and given to students as mediated tools for learning rather than teaching (Jonassen, 1994).

He argues that the differences between objectivism and constructivism create scholarly debate about the paradigm shifts of learning psychology theory and instructional system technology.

The switching pattern is the back bone for the highest level of thinking, and in this process cognitive sciences are being used rather taking support of behavioural details that spread a surge of scientific revolution in learning the psychology (Jonassen, 1991:5). He states that there is a need for a new philosophical paradigm that explains learning not just as a behaviour change but also as a thinking process in the learner's

mind. Learning with technology is not linked to changing behaviours; learning is something that takes place in a learner's mind. Behaviourists such as Thorndike and Skinner tend to consider learning a behavioural change because they ignore non-observable behaviours, while constructivists state that learning is a mental process that happens in the learners' mind rather than a change in an observable behaviour.

However, the interpretation of learning is shifted from a change in observable behaviour to the design of support learning in the constructive way of thinking. Learning space and learning design have implemented computers in teaching, instruction and learning, while constructivism learning theory opens the whole area of individual, co-operative and collaborative learning. Jonassen (1996:3) enjoys the riding of the critical wind to figure out which way it blows that is, verily, critical thinking demands full dedication and sincerity while using the 'mindtools', computer applications, when they are used by the learner to explore about the knowing to keep them abreast and involve in the critical way of thinking.

Jonassen's 'mindtools' are simple computer programmes such as 'Microsoft Word, PowerPoint and Spreadsheet'. These programmes allow learners to engage in thinking, designing and solving their own instructions. This creates a learning environment in which learning is with computer. It is more that a teaching machine in Skinner's use of the term. Nonetheless, if a computer's program can be used as a 'mindtool' for learning by solving problems, now in the era of mobile technology, learners can use mobile devices for solving problems. Instructors and learners facilitate instruction with computers, while learning with mobile devices is being mobilised in term of a learner's location, as a device that can be used at any time, in any place. Sharples, Corlett and Westmancott (2002:221-222) scratches their sides of heads where the brain is actively working for the complexities involved in inventing a profound systemic design and eventually interprets that It is always very nerve wrecking assembling a system with the broken, unclear and blind thoughts appear in the mind, whose main objective is the welfare of the humans. In mobile technology, the systems built with the pedagogies thoughts are human-centred on the theory of how they think and act accordingly in the field of mobile learning.

2.7 The implications of situated paradigms for mobile learning

Situated learning theories serve to investigate how learning occurs according to a social paradigm. Situated theories focus on putting learning in a particular position, situation, or location. Learning is understood to be the development of a particular community of practice. A situated learning approach emphasises that learning is

understood as developing practice in a particular community (Mayes & de Freitas, 2004a). Situated learning emphasises the context, application and use of knowledge. Learning takes place as meaningful context rather than abstract learning in the classroom or with a textbook. Situated learning implies that knowledge is not transferred well across contexts, so it is best to learn in the same context that knowledge is used.

2.7.1 Jean Lave and Etienne Wenger (communities of practice)

Community, an amalgamation of different sort of peoples belonging to vary culture, thoughts, behaviours, mentality, concepts, perspectives, standards, etc; living in one place to share the pleasure of learning in every context in the environment where they all, somehow, feel part of it and endeavour to have the best from others in the term of learning. Once they learn something then they practise, which is very important part of the shared region of human as practice makes the learner adept provided it is practised in the presence of abundant opportunities availed to build a community of practice. Building on Vygotsky's social theory, Jean Lave and Etienne Wenger assume that learning occurs in a particular community of practice (Wenger, 1999). Communities of practice grow and develop, thus continuing to enhance the learning experience of all their members. Communities foster feelings of fellowship with others as a result of sharing common attitudes, interests, and goals.

Community of practice as a social constructivist learning styles in the use of mobile devices, has been addressed by Colley and Stead (2004) in their MLearn 2004 paper titled "Mobile learning = collaboration". For example, "the use of a shared online space shows that learners feel involved and are able to use technology as a facilitator for their own creative ideas" (Lave & Wenger, 1991). Results indicate "learners' affective and social needs are addressed by engaging the imagination and promoting exploration and creativity within a non-threatening environment" (Colley & Stead, 2004:58).

In the case of mobile learning, Naismith, Lonsdale, Vavoula and Sharples (2004:13) indicate the appropriateness of mobile learning in a community where it is concluded that learner participation plays an important role in skills acquisition.

In situated learning, as understood by Lave and Wenger (1991), knowledge and skills are created in contexts, and often serendipitously. Situated learning occurs whenever there is a "break in the flow of routine daily performance and the learner reflects on the current situation, resolves to address a problem, to share an idea, or to gain an

understanding” (Sharples, 2000:2). Educational research into situated learning points out the importance of giving learning a context, while, Karagiorgi and Symeou (2005:24) argue that conversation and collaboration tools, such as mobile technologies, enable communities of learners to negotiate and co-construct the meaning of the problem. An example is computer conferences that support discourse communities as well as other shared knowledge-building tools.

2.7.2 Cole, Engelström and Wertsch (activity theory)

Building on Vygotsky’s social theory and Wenger’s communities of practice theory, Engelström develops an activity theory (AT). “Activity theory is used to identify contradictions between the users needs and the institution vision of how a new innovation would be used” (Bird & Stubbs, 2008:38).

Activity theory can provide a pedagogical underpinning of mobile learning, where technology is a tool to mediate human activity, and the focus rests on cooperation, communication, co-learning, co-inventing, and co-evolution (Cobcroft, Towers, Smith & Bruns (2006:46).

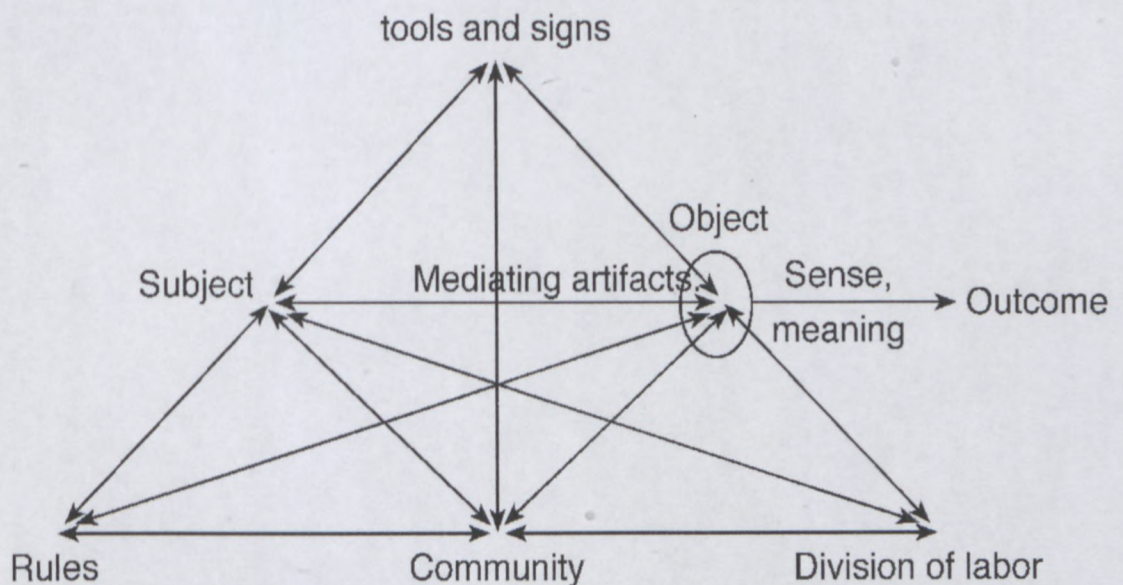


Figure 2.4: The structure of human activity system

(Adapted from Engeström, 1987:78)

In this triangular model of activity theory as a structural system that explains human activity, Engeström expands on Vygotsky’s theory of social dimensions of learning.

He states “ever since Vygotsky’s foundational work, the cultural–historical approach was very much a discourse of vertical development toward ‘higher psychological functions’. Cross-cultural research remained an isolated attempt” (Engelström, 2001:135).

Therefore, it is through experiences that learners learn and discover the world. Mobile devices contribute to these experiences as they develop through manipulating and struggling to use the effective technology. In the mobile learning context, the forms of classroom structure, tools, and tasks contribute to and influence the student’s experience of learning. In applying activity theory, analysts endeavour to determine how such contextual influences affect computing behaviour. Botha, Traxler and Ford (2008:53), in applying activity theory to mobile learning, found that “the extended mediated relationship between the subject and the object offers a general model for human activity that reflects the collaborative nature of human actions”.

In the context of mobile learning, technology can be seen as a tool. Vygotsky’s (1978) theory of socio-cultural learning indicated that context, in the form of classroom structure, tools, and tasks, contributes to and influences the student’s experience of learning.

2.8 Conclusion

Mobility drives the shift in society, which in turn drives the shift in education, particularly learning with technology in Higher Education. The literature shows that learning is changing from learning as a process to learning as an institutional phenomenon. Learning has acquired a social institutional meaning in terms of the learning society, the learning organisation, and even in lifelong learning and mobility learning, as people make use of mobile technology.

The e-learning space is more constrained by location whereas the m-learning space is more concerned with movement and situated instruction and learning because mobile devices are small compared to computers. The fundamental difference is that learning with computers in Higher Education is more formal, while learning with mobile technologies is more informal. New learning spaces are being created by mobility. Learners’ access to digital, wireless technologies is transforming learning environments and university campus lifestyles. E-learning can, however, simply become m-learning without any particular changes in content.

Mobile technologies work in social life as well as in educational institutions. In light of that, some gaps in mobile awareness and how it contributes to the theory of learning need to be addressed in order to understand how people learn with mobile devices in Higher Education. Educators are not sure how learning takes place with mobile learning and if learning is actually taking place when learners are using mobile devices – the literature on mobility does not show how this learning occurs. Now the focus is upon learning, and providers of learning materials no longer have to be educators, or even know about ways of facilitating learning effectively.

The literature indicates that there is a development from traditional classroom learning and distance learning to e-learning and mobile learning. However, the growth of educational technology has changed the teaching and learning process significantly. This development provides space for research about the differences between classroom learning, e-learning and mobile learning. My research was carried out in an attempt to understand the learning and instructional design theories related to mobile learning. Most of the traditional learning theories describe learning that takes place in confined areas. Mobile learning technologies are as portable as lifestyles in most modern societies. The challenge for mobile learning in Higher Education is how much impact it will have as formal learning.

This chapter characterises a theory of mobile learning in three contexts: associative (learning as activity), constructive (learning as achieving understanding) and situated (learning as a social practice). This section reflects upon the underlying theories, characteristics and themes that may help to develop the theory of mobile learning. To understand the position of mobile learning in the Higher Education landscape, an understanding of the combinations of technology, learner and learning that stem from mobility, is a priority.

In the theory of behaviourism, the role of 'stimulus and response', or how the learner acquires learning and knowledge, interacts associatively with the learning activities during learning behaviours. One asks how the behaviourists' theory of stimulus–response describes mobile learning. What individual learning and the collaborative role of mobility in terms of learning within the stimulus–response condition for mobile learning context means.

Behavioural adopts a transmission model – learning takes place through the transmission of information from the tutor (the mobile learning system) to the learner. For more connection the mobile learning system provides learners with learning tasks

(stimulus) and the learners respond appropriately (response). Pavlov's theory has some relevance to mobile learning. Nevertheless, his theory is not applicable to all aspects of mobile learning in terms of learning mobility. The connectionism theory was applied in early computer learning systems, and still is to mobile learning systems, that were designed based on a behaviourist approach to learning. Neither theory is adequate to explain the whole context of mobile learning activities. For instance, machines can teach, and that means that students can learn.

Skinner's theory of teaching machines supposes that machines are tools that mediate for supporting and enhancing teaching/learning. Educators may use machines to enhance and support learning and should use learners' mobile machines to learn. Despite a move away from the behaviourist perspective within the field of learning theory, many e-learning systems still rely heavily on the teaching machine approach.

Learning with mobile devices may not appear as measured behaviour. Associative theory seems to be inadequate for mobile learning, as certain aspects of learning with mobile devices are not observable; they are mental processes. In the same way, mobile technology might not drive a stimulus–response condition of learning. In this sense mobile technologies do more than facilitate academic learning; they also enable non-academic learning outside confined, observable places.

Mobile learning makes sense if it is used outside a traditional e-learning environment, where other means for computer-aided learning are not available. The optimal system would be the integration of traditional teaching, e-learning and m-learning. With a possible pervasive learning environment, the potential to achieve what m-learning always promised – 'always-on' learning, accessible to the masses, but tailored to the individual – is a reality.

The Constructivist theory as an individual approach shows that mobile learning manifests as self-regulation learning. Mobile Learning that provides opportunities for connectivity and interaction has the potential to provide the learner with a meaningful learning environment, one in which the learning is situated in a real-life context (Wenger, 2006). Mobile learning technologies provide a cognitive structure of multi-functions that make it possible for students to use their own thinking to design and to learn – learning with mobile technologies requires people to think, design and deploy their own freedom in creating learning tasks and instructions.

In the mobile learning context there is a lack of ethical consideration of mobile technology usage among the youth, and it appears that many people complain about mobile media. Papert termed this alternative approach to constructivist learning 'constructionism', as learners were actively constructing their own knowledge and learning by building interactive models.

Echoes of the work of Vygotsky (1962; 2000) are found in mobile learning in social activities such as socialising, sharing and mediating mobile technologies and learning activities. The collaborative classroom and outdoors learning in the mobile learning environment provide opportunities for the social interaction of students. The method of encouraging students to construct their learning in a supported learning environment provides a collaborative and consultative social constructivist approach for learning (Vygotsky, 1978).

Situated learning theories show how learning occurs according to social paradigms. In the mobile learning context, the situated learning paradigm developed to hold that learning is not merely the acquisition of knowledge by individuals, but instead it is a process of social participation. However, work-based learning, continuing professional development and apprenticeships are typical examples of situated learning.

CHAPTER 3

CONCEPTUAL FRAMEWORK

The previous chapter examined the body of literature of learning and instructional design theory that resonates with mobile learning in the Higher Education context. It discussed literature on various theories, principles and theorists. This chapter focuses on the research design for this project. It examines the research assumptions, methodology, approach and methods for collecting and analysing data. The research design is based on qualitative grounded theory used in this context as an inductive approach. The chapter also analyses the relationships between the initial concepts, emergent themes and the current theoretical approaches. These analyses provide a platform for developing categories for the theory of mobile learning.

Furthermore, the chapter contains an article that was published in the International Journal of Educational Technology and Society. The article is presented here with the permission of the journal editor.

El-Hussein, M. O. M., & Cronjé, J. C. 2010. Defining mobile learning in the higher education landscape. *Educational Technology & Society*, 13(3):12-21, July.

The article indicates that mobile learning may, in the future, be a core pedagogical activity in institutions of higher learning. Mobile learning has increased in terms of mobility of technology, mobility of learners and mobility of learning. Many researchers have defined mobile learning from different viewpoints. Mobile learning assumes that learners can move with mobile devices and possible wireless connections. Mobile devices could also provide meaningful assistance to users in terms of work, study and entertainment.

In the context of education, learning processes and outcomes should be considered taking into account extensions to the classroom or lecture. The article attempts to interpret the meaning of mobile learning in Higher Education by applying mobile

concepts and characteristics as various elements of the mobile learning experience. These elements are at the heart of the conceptual framework of this study.

DEFINING MOBILE LEARNING IN THE HIGHER EDUCATION LANDSCAPE¹

3.1 Introduction

The evolution of handheld portable devices and wireless technology has resulted in radical changes in the social and economic lifestyles of modern people. Today, many technological devices are produced in portable form and people have become accustomed to them. These devices are reshaping users' daily lives in different ways. But the development of digital technologies has so far been limited to social communication and few people have regarded mobile learning as a core pedagogical activity in higher institutions of learning. Although this model has been used as a minor adjunct to learning activities such as lectures and assignments, it is still not the primary mode of delivery in Higher Education. Currently, the instructional technology transmitted by means of mobile technology is mainly social and, to a lesser extent, economic

Advanced mobile devices such as "smart" cellular telephones are very popular among people primarily because they are wireless and portable. These functionalities enable users to communicate while on the move. The popularity of these devices is therefore a consequent of their ability to function at multiple levels. Moreover, the intense commercial competitiveness in the mobile device industry is forcing manufacturers to be very innovative, constantly striving to introduce new features that can give them a competitive edge.

Against this backdrop, visionary educators, designers and developers should begin to consider the implications of these devices for the modern teaching and learning environment. In such an environment, contents and services can be relayed to a university student by personal wireless mobile devices. This will add another layer to the personal computer-based model of teaching and learning. This also means e-learning will take place in conditions that will be radically different from those educators and learners are familiar with. Providing university students with services,

ISSN 1436-4522 (online) and 1176-3647 (print). © International Forum of Educational Technology & Society (IFETS). The authors and the forum jointly retain the copyright of the articles. Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear the full citation on the first page. Copyrights for components of this work owned by others than IFETS must be honoured. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from the editors at kinshuk@ieee.org.

content instruction and information outside the traditional learning space is becoming more acceptable among education providers who predicate their services on the routine use of advanced information and communication technologies.

This article seeks to provide a definition of mobile learning and attempts to understand why actual learning practices are changing very rapidly while the learning theories that support educational practices are not. To find viable answers, the article will describe the different components of mobile learning that reflect on the increasing mobility of learners, learning and learner technology.

The emergence of revolutionary technologies has had a significant impact on educational technology. It has increased the potential of e-learning as a mode of delivery in education. By definition, mobile learning (or "m-learning") is learning by means of wireless technological devices that can be pocketed and utilised wherever the learner's device is able to receive unbroken transmission signals (Attewell & Savill-Smith, 2005). For example, Laouris and Eteokleous (2005) have reiterated the need for a definition of mobile learning that takes into account all the aspects of the mobile learning process Nyir (2002) has also contributed to a philosophy of mobile learning that relies on Dewey's insights into democracy and education. Nyir and his contemporaries argue that mobile devices are responsible for undermining and, in many cases, eliminating the fixity of traditional classrooms such as lecture halls, laboratories and all the paraphernalia of traditional education. For decades, these traditional spaces have depended on static models of communication and devices for subject delivery. Significantly, mobile devices are revolutionary because they transcend the boundaries of the structural stasis of classrooms and lecture halls and their associated modes of communication – they do not have to be confined to one particular place in order to be effective.

3.2 Research method

The purpose of this article is to reflect on and understand the position of mobile learning in Higher Education. It also hopes to develop a succinct definition applicable in the context of university and college education. The bulk of this article is primarily an analysis of the literature about mobile learning. It sets out to critically examine a selection of documents that relate to mobile learning. These documents consist of conferences proceedings, journal articles, reports, projects and pilot studies of mobile learning projects. Nieuwenhuis (2007b:82) shows how such texts can shed some light on the phenomenon under investigation. It was therefore necessary to read and reflect on all these documents, to draw conclusions about issues around mobile learning. This approach allowed the authors to identify relationships and connections

between the ideas and information from the literature, and explicate existing relationships between theory and practice in the field of mobile learning.

In order to identify the appropriate body of literature in this field, we conducted an online search of the international journals that are devoted to research on mobile learning. The most important of these resources are described in Table 1.

Table 3.8: Results of a web search to find the most important resources on mobile learning

Name of resources	Rationale	URL
Journal of educational technology and society	ET & S deals with research on knowledge in the modern world and how it is transformed by the development of revolutionary technologies in society.	http://www.ifets.info/other/s/
International Journal of Interactive Mobile Technologies (iJIM)	(iJIM) describes the most recent trends and research outcomes and presents the various aspects of interactive mobile technologies.	http://www.online-journals.org/index.php/i-jim
International Journal of Mobile Learning and Organisation (IJMLO)	(IJMLO) is a refereed, multidisciplinary journal which publishes research on the latest changes in mobile learning	http://www.inderscience.com/browse/index.php?journalCODE=ijmlo
International Journal of Mobile Communications (IJMC)	(IJMC) focuses on the international scope of overcoming cultural and national barriers. It also publishes articles on the accelerated rate of technological changes in the global economy.	https://www.inderscience.com/browse/inde.php?journalID=40
The Conference Proceedings of MLEARN 2004	The theme of this conference was "Learning anytime everywhere"	http://www.mobilearn.org/mlearn2004/

Most of the articles in these academic journals and conferences present research evidence on the practicalities of mobile learning. The papers were selected based on the extent to which they have succeeded in explaining and describing how mobile learning is growing in visibility and how it is acquiring an incremental importance in Higher Education practice throughout the developed world (Traxler, 2007).

After selecting the appropriate articles, they were analysed by tabulating the various themes and sub-themes as mobile technology, nomadic learner and mobile learning addressed by each article. Common themes were then clustered and these clusters were used as the structuring themes of this article.

3.3 A Conceptualisation of mobile learning

The first step to research edification is to explore the wider context of mobile learning. Mobile learning as an educational activity makes sense only when the technology in use is fully mobile and when the users of the technology are also mobile while they learn. These observations emphasise the mobility of learning and the significance of the term “mobile learning”. Traxler (2007) and other advocates of mobile learning define mobile learning as wireless and digital devices and technologies, generally produced for the public, used by a learner as he or she participates in Higher Education. Others define and conceptualise mobile learning by placing a strong emphasis on the mobility of learners and the mobility of learning, and the experiences of learners as they learn by means of mobile devices.

The two terms under consideration in this article are therefore mobility and learning. On the one hand “mobility” refers to the capabilities of the technology within the physical contexts and activities of the students as they participate in higher learning’s institutions. On the other hand, it refers to activities of the learning process, the behaviour of the learners as they use the technology to learn. It also refers to the attitudes of students who are themselves highly mobile as they use mobile technology for learning purposes.

Traxler (2007) writes: “so, mobile learning is not about ‘mobile’ or about ‘learning’ as previously understood, but part of a new mobile conception of society”. Research and reflections on mobile learning should stimulate multidisciplinary and interdisciplinary thinking and methods in education. They should facilitate our understanding of outdated concepts and rigid assumptions about learning and what it may be in a society that has changed (at least from a technological point of view) out of all recognition in the past few decades.

In this sense, it is impossible to attribute one fixed meaning to the concepts of mobile learning. To fully understand this concept, it is critical to consider the relationships between each of the words used to describe the phenomenon of mobile learning. The use of this premise to understand mobile learning presents an enormous challenge because there are many words and terms, which have been used to define and explain mobile learning as a phenomenon.

For example, Laouris and Eteokleous (2005); conducted a Google search in January 2005 by using the formula {+ “mobile learning” + definition} – and the search

produced 1,240 items. When they repeated the same search at end of June 2005 - only six months later, it produced 22,700 items.

To this end, the way in which the responses of previous search are understood will depend on who is asking a question; why they are asking it and the context in which question is being posed. It also depends how the concepts contribute to the total meaning and understanding of the phenomenon. This means different people mean different things when they use the terms "mobile learning".

Traxler (2007) notes that there are some definitions and understandings of mobile education, which focus only on the technologies and hardware, whether it is a handheld and mobile device such as personal digital assistants (PDAs), Smartphones or wireless. These definitions undermine a proper understanding of the uses of mobile technology in learning by confining their explanations and descriptions to the actual physical way in which the technology operates. Other definitions place more emphasis on what learners experience when they use mobile technologies in education, while others inquire how mobile learning can be used to make a unique contribution to the advancement of education and other forms of e-learning.

Mobile learning values and defends in its own unique way the introduction of what is radically new in the technological, social and cultural spheres of human life and activity. We argue that human beings are obsessed by the desire to change, to explore, to learn, design and to introduce what is absolutely new into the framework of past conventions and protocols. Mobile learning opens our minds to the possibility of a radically new paradigm and encourages us to abandon the constraints of our habitual ways of thinking, learning, communicating, designing and reacting.

This argument provides a strong theoretical framework for understanding how mobility and learning are manipulated in design paradigms. However, "the pedagogical view of collaborative learning can be regarded as the theoretical fundamental of design perspective and technology also supports the design view of the system. After students manipulate the mobile blogging system in a learning activity, the use of collaborative and technological perspective should be observed in the experimental process which can further influence the design aspect by evaluating the learning effect of students" (Huang, Jeng, & Huang, 2009).

Traxler (2007:1) again cautions that "the role of theory is, perhaps, a contested topic in a community that encompasses philosophical affiliations from empiricists to post-

structuralists, each with different expectations about the scope and legitimacy of a theory in their work". If we are to place the phenomenon of mobile learning within the context of the theories of instructional design, we need to "break down the walls to open up new spaces" (King, 2006:171). This means examining some of the foundational assumptions and presuppositions on which all-previous understandings of the term "Higher Education", or post-school education, are constructed. By using mobile communication devices to deliver Higher Education content, we are likely to reduce the physical walls of the classroom and replace them with other virtual barriers or constraints. (Järvelä, Näykki, Laru & Luokkanen, 2007).

While the content of the education may remain the same, it is delivered by means of a radically new technology that combines the advantages of the Internet as a convenience of portability and education "at any time and in any place". King (2006:171) highlights how radically different the procedures connected with mobile learning are, when he writes: "by breaking down the assumptions and process behind writing and speaking, we can go beyond them and find new ways of thinking about the world".

The advent of the technology has created new signs, new ways of writing and receiving information, and new ways of transmitting video clips. These activities are rendered new and unique by a similar function: mobility. Mobile technologies permit users to benefit from the changes in language and signs that have entered our language and experience in the wake of these new technologies.

Derrida (2006) proposes that texts consist of "signifiers" (words) and the "signified". The ways in which mobile technologies are used have produced a whole new lexicography of signs and numbers as well as conventions for 'deconstructing' them. One example of this new lexicography is the number "4" (conventionally the signifier for the numerable "four"). But in mobile-jargon, a kind of written patois, for this generation of Higher Education learners, this numeral signifies the adverb "for", as in "Just for me", which in mobile technology text would be written "just 4 me".

The limitations of mobile technology such as the small screen size of most of the devices, and the exponential increase in the number of messages sent as SMSs (Short Message Services), have resulted in the unforeseen consequence of creating new signs ("signifiers") for new meanings (the "signified"). While these ways of communications have subverted all the forms and conventions of formal language, they are nevertheless widely accepted and understood and therefore considered to

be normal in the context of mobile cellular devices. In fact, one of the limitations of mobile cellular hardware (the very limited size of its screen) provided the impetus to design a personal instruction and learning, and utilise a new format for text communication as well as imbue traditional forms with and different meanings.

Mobile devices have therefore encouraged users to redesign old signs of instruction by attributing new meanings to them. They reflect on the processes involved in this activity and point to the fact that: "the danger to meaning [comes] from what is outside the sign {i.e., is neither the acoustic material used as the signifier, nor the signified concept the sign refers to}. In the moment of writing, the sign can always 'empty' itself...for here the general conditions for a deconstruction of metaphysics based on the notions of writing and difference, and first arrived at through a reading of how the notion of the sign functions in the phenomenology, are explicitly stated" (Derrida, 2006:xii-xiii).

The purpose of Higher Education and the relatively new ubiquity of mobile devices in our culture have imbued the mobile device with new meanings. Higher Education can now be presented in a more sustained and interactive fashion to empower those who need it. The ontological irony of the situation is that certain unintended developments in the social lifestyles of those who regularly use mobile technologies have opened up new possibilities for mobile interactions that are not confined to social situations. What is being claimed is that new forms of social life and human interactions owe their origins to technical developments. Interestingly the limitations have compelled users to design new modes of interaction that utilise text rather than face-to face encounters. This implies that "the ontology design enables for a more generic approach – it provides a common formalism for representing context-relevant metadata for content units of diverse levels of granularity" (Jovanović, Gašević, Knight & Richards, 2007:50).

According to (Huang, Huang & Hsieh, 2008:3), the environments in which the study of mobile learning has been conducted have some similar features with in previous studies. These features include:

1. enhancing availability and accessibility of information networks;
2. engaging students in learning-related activities in diverse physical locations;
3. supporting of project-based group work;
4. improving of communication and collaborative learning in the classroom, and;
5. enabling quick content delivery.

However, mobile learning provides the support for learning and training, and “mobile technologies have contributed to the potential to support learners studying a variety of subjects” (Järvelä, Näykki, Laru, & Luokkanen, 2007:71).

3.4 Mobile learning in Higher Education

The most important yet sophisticated concepts for designing instruction in this context are identifying the technology, learner and learning material as well as mobile technology such as portable devices. It also involves identifying learners who are nomadic and able to understand and interpret learning materials. “In general, mobile learning – or m-learning- can be viewed as any form of learning that happens when mediated through a mobile device, and a form of learning that established the legitimacy of ‘nomadic’ learners” (Alexander, 2004:2).

These are the developments that have made mobile devices strategic tools with the capacity to deliver Higher Education instruction in a way that was never anticipated when the first prototypes of these devices were designed and marketed. Designers can deliver successful Higher Education products to the present generation of learners, by means of a technology, distinctively adapted for its own personal (mostly social) purposes. This makes technology a particularly potent tool for the delivery and reinforcement of content that would otherwise be identified with the Higher Education “establishment”. Devices “such as mobile phone and mp3 players have grown to such an extent over recent years and are gradually replacing personal computers in modern professional and social context” (Attewell & Savill-Smith, 2005). Modes of communication that were spontaneously developed by the younger generation have been subverted to serve the purposes of transmitting Higher Education. Such structural changes in the delivery of Higher Educational instruction add a powerful tool to the arsenal of available means that educators can use to make delivery more efficient, personal and culturally acceptable to those who pioneered these new modes of text delivery (Fullan, 2007).

These fundamental changes pose new problems to the designers. What new design paradigms and meanings can be attributed to the use of mobile technology? How can we appreciate their full significance within the context of traditional instructional design theory? Before the development of new forms of information and computer technology such as the current mobile “smart” cellular telephones, the design paradigms by means of which the delivery of Higher Education was understood remained essentially static. The extraordinary potential inherent in mobile devices,

anticipate radical changes in the very structure of educational dynamics especially in the way in which people interact with one another in society.

The kind of informal learning through the use of mobile devices makes it an even more potent tool of educational communication than the customary forms and modes of traditional education. These revolutionary changes developed out of the unforeseen significance of human social life generally more “mobile”, creative and opportunistic, than the formal modes of traditional education.

3.5 The Definition

The foregoing observations can help designers to understand the position and significance of mobile learning in the context of Higher Education. It is possible to argue that the portability and mobility of these technological devices have had strong implications for the meaning of terms that had been extensively defined in existing literature. Using the mobile device as a signifier, the concepts of mobility can be divided into three significant areas: mobility of technology, mobility of learner and mobility of learning especially in Higher Education landscape.

This tripartite division of mobility is evident in the current literature on the subject and designers who have used mobile technology for educational purposes have confirmed this. Figure 1 below is a graphic depiction of the three divisions of mobile devices that can deliver a higher level of educational instruction. In practice, the technology, the learner and the actual learning process operate in an uninterrupted continuum within the social context of education. The subversion of the signifier here (that operates to the advantage of the educator and the educated) is that mobile devices were constructed and marketed as forms of technology, designed solely to enrich and enhance the social and personal lives of users. The successful delivery of Higher Educational instruction depends on the tripartite significance of the word mobility as it is used in the context of Higher Education. These three elements are interdependent and are equally important in making mobile devices viable as instruments for the delivery of Higher Education instructional contents.

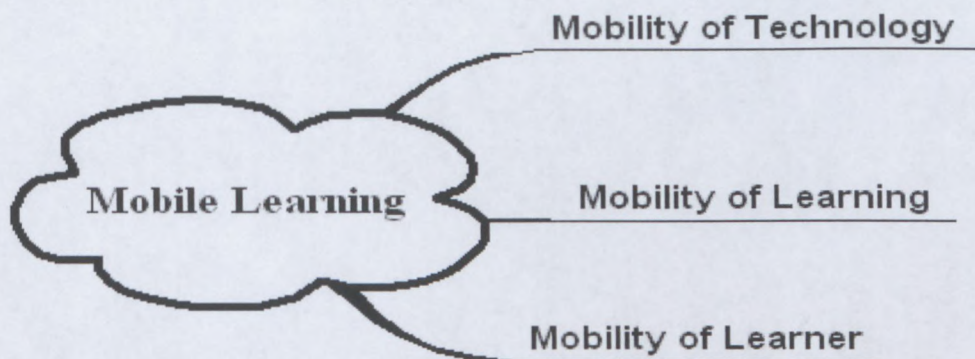


Figure 3.5: The three concepts of mobile learning

Accordingly, the article's authors define mobile learning as learning environment based on mobility of technology, mobility of learners and mobility of learning that augments the Higher Educational landscape.

3.5.1 Mobility of technology

The mobile technology referred to in this article is mainly more advanced cellular telephones. But there are other forms of technology such as "smart" phones, digital cameras, flash-discs, iPods and personal digital assistance devices (PDAs). Mobile devices used to deliver Higher Education content and instruction can also function as audio-players, media-players and digital cameras. Advanced mobile devices are furnished with "Wireless Application Protocol (WAP) and Wireless Fidelity (Wi-Fi)" (Kukulska-Hulme, & Traxler, 2005a: 2007) capacities so that a user can connect to the Internet by means of his or her PDA" (Trinder, 2005).

The mobile cellular devices mentioned above have the capacity to link to the Internet and deliver content and instruction that can enable learners to learn at any time and anywhere in a format that is culturally prestigious among people in the same age group. Most of the more advanced models can support a portable, digital and wireless lifestyle and mode of teaching and learning. It is precisely the mobility of these devices that makes them highly prestigious and therefore desirable as instruments of learning among learners in the same age group. In fact they are highly valued by young people in their early twenties because they are visible indicators of wealth, privilege, luxury and modernity. Mobile devices with advanced features like those mentioned above are therefore regarded as more trendy, fashionable and prestigious among these consumers than the standard desktop personal computers that connect to the Internet by means of landlines.

The first designers of this mode of delivery were extremely ingenious in the way in which they exploited the prestige and iconic value of mobile devices among young people in their twenties. Educationists have in effect adroitly utilised one of the most potent symbols of wealth, prestige and fashion among the young. Education by means of mobile devices is therefore nothing if not revolutionary in its design methods, implications and results.

Trinder (2005:7-8) explains the functionalities of the most popular and expensive mobile phone technologies. These include an organiser, video camera, telephone, GPS and film player. They also include games, e-book, e-mail facility, Internet access and musical MP3s. But the most popular functions in all mobile phone remain the short messaging service (SMS) and the multimedia messaging service (MMS) – frequently used functions in the delivery of Higher Education instructions. This innovation has been discussed in terms of Trinder’s (2005) classification of PDA functionality.

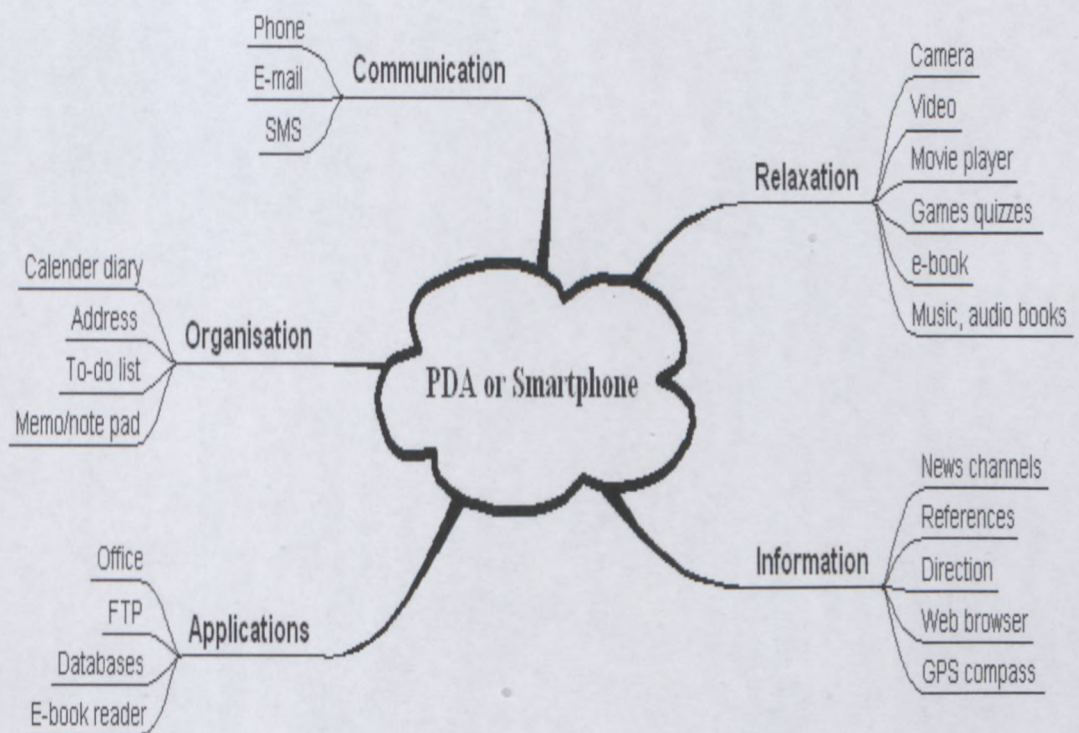


Figure 3.6: PDA technology

(Adapted from Trinder, 2005:7)

Figure 3.6 highlights the functions of Personal Digital Assistant (PDA). This device connects easily with the Internet, and enabling it to perform many different functions.

(Kukulka-Hulme & Traxler, 2005a:2): Also "when combined with wireless connectivity, learning activities can be monitored and coordinated between locations. However, the task of designing such activities and appropriate learner support is complex and challenging. The impacts of new mobile technologies need to be appraised and evaluated" (Kukulka-Hulme & Traxler, 2005b:2). This is because of the challenges that still have to be overcome before this mode of educational delivery becomes as widely accepted as e-learning. However, Motiwalla (2007) states that although it is inevitable that m-learning will soon become an essential extension of e-learning, this transition will not happen overnight. Instant access to learning at any time and in many places will obviously be very useful to learners, but only to a privileged few until wireless technology becomes more efficient and widely available. It also depends on designers' ability to apply the appropriate forms of instruction that will make this mode of learning an essential tool in the delivery of Higher Education.

From a technological point of view, mobile devices are becoming more and more capable of performing all the functions necessary in learning design. Since affordability and sophistication of mobile device technology have increased its popularity within the educational context and, educationalists should determine whether current theories of psychological, educational learning and instructional design are adequate to describe the processes and meet the challenges posed by this new mode of delivery. Traxler (2007) writes: "[designers have] not explored the actual technologies or pedagogies in any detail and [have] sought to define questions for discussion rather than provide answers for what might in fact be premature or inappropriate questions".

3.5.2 Mobility of learners

E-learning mediated by personal computers is mostly bound by location and time (availability) because of the configuration of a personal computer. There has no wireless learning tool linked to the Internet, which means that one must always work in one place at anytime. Considering the personal computer at home determined by availability and connectivity. But with mobile learning, learning can occur at any place and at any time. The ordinary (non-mobile) personal computer with landline connections to the Internet is constrained by the places in which they are located and their availability. Non-portable personal computers are too heavy to move easily and so learners are compelled to work in the same place and during the time slots allocated to them by university authorities. By contrast, learning with mobile is a learner-centric activity because it is both mobile and nomadic, and pedagogically teacher-centric as in the case of traditional lectures and hardware installed in one

particular location under the aegis of the university's authorities. However, m-learning can be organised to be teacher- centric.

Ting (2005) makes the following remarks about what are the advantages of mobile learning: "The overall advantages provided by the mobile learning are [that it is characterised by] more flexible, accessible and personalised learning activities. Such advantages [...] keep the learners engaged in the ongoing learning activities and enhance their productivity and effectiveness". Furthermore, Guralnich (2008) suggests that the designer would be better served if he/she considered the entire context in which learners will use particular m-learning programme. However, today's designers often tend to borrow design ideas from their e-learning experience.

Mobile learning devices also have the capacity to enhance a learner's sense of individuality and community as well as his or her motivation to learn through participation in collaborative learning. These devices stimulate a learner's sense of ownership of the content as he/she participates actively in a variety of social, collaborative and cooperative activities - all of which are centred on the mobile learning device.

Educators and designers should address the needs of learners in this age of wireless communication and connectedness. Slogans such as "walk and use", "walk and talk", "just for me" and "just in time" usher in the new phrases in education like "You ring, we bring" ushered in previous developments in society. Instructional theory in this mobile age might be learner-centric rather than technology or teacher-centric. This is because, as Uden (2007) observes: "Mobile technologies offer new opportunities for students' educational activities in that they can be used across different locations and times". Students using mobile technologies are not only remote from their instructors; they also fully control the access of information on their mobile devices. In this light, one of the main advantages of mobile learning is that it allows this generation of learners to enjoy a certain amount of freedom and independence.

3.5.3 Mobility of learning

Researchers and practitioners of mobile learning are engaged in pioneering experiments for transmitting the full content of higher learning to students by means of mobile cellular devices. Walker (2007) points out that the advantages of mobile learning are not dependent solely upon the ability to use a portable and wireless communication device successfully. He argues that the kind of learning experienced by mobile owners is unique because it is received and processed within the context in

which the learner is situated. The context is utterly individual – completely different from the rigid outlay of the traditional classroom or lecture room, and the computer laboratory.

The international conference on mobile learning entitled MLearn 2004 adopted as its guiding statement the desire to provide “learning anytime and everywhere”, that adopted the stage of one-to-one computer in 1980s. Attewell & Savill-Smith (2005)’s paper and those of other contributions were designed to indicate how such a vision could be fulfilled. Most of the papers presented at this conference focused on the description and development of theories that would support the practice of mobile learning and the design production of mobile learning materials and systems.

Mobile learning devices have also enriched the theory and practice of e-learning. Contemporary consumers of Higher Education in developing countries almost always use mobile learning devices as adjuncts to e-learning in Higher Education. Sophisticated mobile devices are currently capable of delivering a comprehensive range of e-learning materials by means of web connections, infrared and bluetooth transmissions. For Ally (2005) “mobile learning [is at the] intersection of mobile computing and e-learning; [it provides] accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning and performance-based assessment”.

There are two well-publicised convergences that are affected by mobile technology:

- Firstly, a convergence between mobile technologies as learning and instructional design, and the marketing of mobile computer-communicators are combined into a single device. This device is able to access the Internet, function as a telephone, camera, video and audio player and perform wireless computing tasks.
- Secondly, and equally importantly, a “convergence is occurring between the new personal and mobile technologies and the new conceptions of learning as a personally-managed lifelong activity”.
(Sharples, Taylor & Vavoula, 2007).

Table 3.9: Convergence between learning and technology

(Adapted from Sharples, Taylor & Vavoula, 2007:4)

New Learning	New Technology
Personalised	Personal
Learner-centred	User-centred
Situated	Mobile
Collaborative	Networked
Ubiquitous	Ubiquitous
Lifelong	Durable

Table 3.11 encourages the designers to ask the following questions as they reflect on these new modes of educational delivery: "What does this new mobile technology bring to learning?" One of the most significant answers to this question is: "New technologies allow us to develop full digital records of our lives and experiences" Beale (2007). "mobile networked technology enables people to communicate regardless of their location. Computer technology, like learning, is ubiquitous: computers are embedded in devices such as photocopiers and televisions that perform human-oriented functions (including basic instruction and user guidance) rather than acting as general-purpose computing devices" (Sharples, Taylor & Vavoula, 2007:4)

Laouris and Eteokleous (2005) highlight the changes that one can expect to occur in consumers of Higher Education when "tomorrow's learners will have access to a dynamically changing repertoire of devices and services that will differ in speed, processing power, monitoring (and other outputs) characteristics. As our engagement with technology changes with time, mobile learning becomes a function not only of time, but also of the momentarily available and dynamically changing technology" Laouris and Eteokleous (2005).

For Banks (2008): "further studies are painting a picture of today's youth becoming increasingly comfortable and accepting of their new digital lifestyles, powered by technology such as mobile phones. These phones are, enriched by portable entertainment devices such as iPods, digital cameras, Sony PSPs, and Nintendo's Gameboy. Friendships are made, maintained and lost online often in virtual worlds and on social networking sites such as MySpace and Facebook. Much of what we are seeing today—generally out of the classroom but increasingly in it—is technology-driven, but this technology is not universally accessible to all" (Banks, 2008:53). If Banks's vision is correct, then more and more institutions of higher learning will embrace the potential inherent in emerging wireless and mobile technologies for the purposes of Higher Education. Despite the importance of mobile wireless technological devices as the sole provider or as an adjunct provider of Higher

Education in the not-too-far future, there are still those who refuse to recognise the potential of this emerging form of educational delivery.

3.7 Conclusions

In conclusion, the authors define mobile learning as “any type of learning that takes place in learning environments and spaces that take account of the mobility of technology, mobility of learners and mobility of learning”.

Since mobile learning is spreading rapidly and likely to become one of the most efficient ways of delivering Higher Education instruction in the future, it has become necessary to examine its implication for the design of teaching and learning. The uses and applications of mobile learning have multiplied in different contexts even though the eventual consequences of the proliferation of this medium are not yet entirely clear, either to designers and practitioners themselves or to researchers.

It is necessary for research on the effects and modes of mobile learning to investigate and explore the practice of this particular medium in terms of the instructional design theories of the past, and to adapt such theories so that they can account for the extraordinary number of changes that have taken place not only in education, but in society at large.

Designers and practitioners of education are therefore responsible to produce coherent and reliable accounts of the likely consequences of the proliferation of mobile devices in the Higher Education landscape. The proper design of the technologies leads to greater effectiveness of mobile learning. Such accounts should consider the multiplicity of meanings that are implied by the mobility of educational delivery and the mobility of learners. It is also necessary to describe in detail the various advantages and disadvantages of mobile instructional devices as tools for the delivery of Higher Education. Philosophers of education should explain the philosophical and theoretical assumptions of mobile learning in Higher Education. They should also clarify the design paradigm shifts that this mode of delivering Higher Education has introduced into the world of practice.

CHAPTER 4

RESEARCH DESIGN AND APPROACH

4.1 Introduction

The research is based on a qualitative grounded theory approach, in order to achieve the general qualitative research objectives – in-depth exploration, describing and understanding. According to Creswell (2007:62-63) “grounded theory is to move beyond description and to generate or discover a theory”. The key idea of this research is to communicate and interview experts who are using mobile devices for academic activities.

This thesis aims to explore the position of mobile learning in the Higher Education landscape. It argues that multidisciplinary phenomena of mobility, learning, learner and mobile technological dynamics have spurred complex and conflicting discourses about mobile learning in the higher institutions of learning. Recurrent paradigm shifts and changes have had a visible impact on teaching and learning in higher institutions. For example, mobility of citizenship and globalisation, people demography, work and economy, privacy and public, individualisation and socialisation, commoditisation and policy into practice. Mobility of technologies, learners’ location and learning spaces may change the institutional ideologies that have resonated with the pedagogical theory of learning and instructional design, teaching and learning, as well as learners’ behaviour and mindsets.

4.2 Research assumptions

The basic epistemological assumption is that as individuals interact with their world, they construct meanings socially. This means that the world is not a fixed, single, agreed or measurable phenomenon. Here, epistemology is the philosophy of knowledge or how human beings understand knowledge (Trochim, 2001, Creswell, 2007). It seeks to understand the relationship between the researcher and what is being researched and reduce the distance between them. The researcher collaborates, spends time in the field with participants, and becomes an ‘insider’ (Creswell, 2007). Burrell and Morgan (1979) developed a system of four quadrants for the analysis of social theory. I have chosen the relativist and radical humanist approach of research to explore mobile learning.

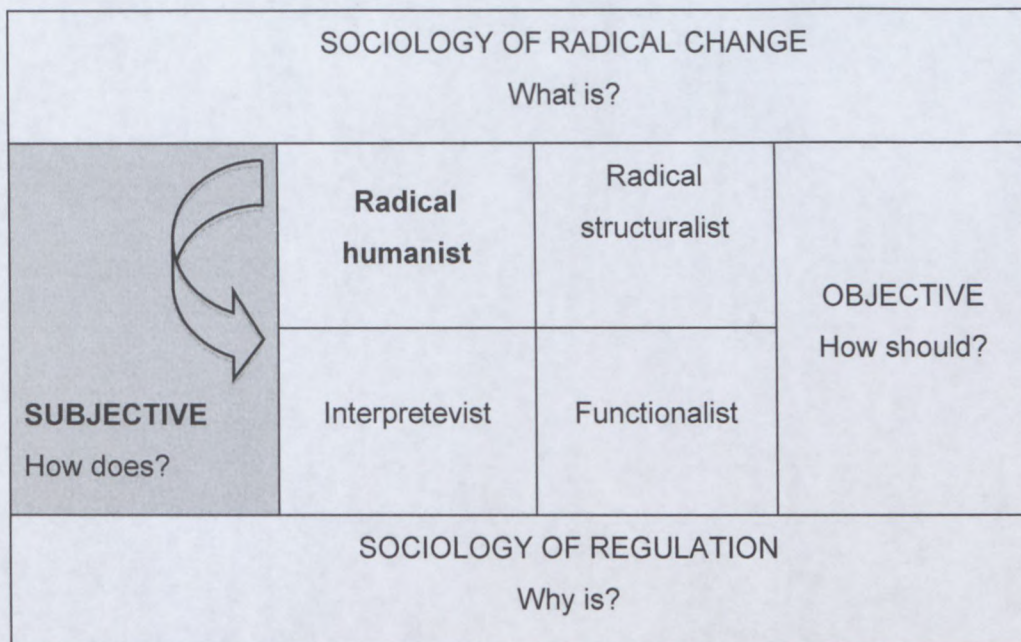


Figure 4.7: Four paradigms for analysis of social theory

(Adapted from Burrell & Morgan, 1979:22)

The rationale for the research is that mobile learning is more a social construction than a subjective construction, and that informs the research aim and research questions. The radical humanist viewpoint, as reflected in this research, “is an outlook or system of thought attaching prime importance to human rather than divine or supernatural matters. Humanist beliefs stress the potential value and goodness human beings” (Charmaz, 2006:5). They emphasise common human needs and seek solely rational ways of solving human problems. For me this paradigm is mainly concerned with releasing social constraints that limit human potential. I see the current dominant ideologies as separating people from their true selves (Caffarella & Merriam, 1999:124). Therefore, I use this paradigm to justify a desire for becoming involved in or causing a complete or dramatic change. It’s largely unlike the structure or arrangement of related or connected items in scope. The “radical humanist paradigm is also typified by a subjectivist view but with an ideological orientation toward radically changing constructed realities, relating to or affecting the fundamental nature of something far-reaching or thorough” (Doty & Glick, 1994:250).

Qualitative research is therefore based on a relativistic, constructivist ontology which claims that there is no objective reality but multiple realities constructed by human beings. People impose order on the world in an attempt to construct meaning. Here, meaning lies in cognition not in elements external to human beings (Charmaz, 2006:5). The information impinging on the cognitive systems is screened, translated,

alternated or perhaps rejected by the knowledge that already exists in that system. This process produces knowledge, which is idiosyncratic and purposefully constructed (Krauss, 2005; Lythcott & Duschl, 1990).

The basic assumption is that knowledge claims must consider the condition of the world today and existing perspectives. On one hand, theory provides a platform for meaningful learning. On the other, research generates and critiques theory, and without this co-dependent relationship any theory or research will not be very valuable in considering the implications of the theory. This research must recognise the existence of different worldviews and concepts of reality, rather than one 'correct' or 'true' one.

I focused on the way people use mobile technologies for instructing and learning within instructional technology. My research was concerned with questioning the nature of reality and its multiplicity of meaning. For ontologists, qualitative researchers should use quotes and themes in the words of the participants and provide evidence for different perspectives (Creswell, 2007).

The reason is so that multi-disciplinary lines of theoretical argument can be adopted, which draw on the relationship between academic manuscripts and what is really happening in the field of mobile learning from the participants' point of view. The research processes discuss the research themes from the current literature of mobile learning as a part of e-learning. These arguments pay attention to learning and instructional design theories and include participants or stakeholders in the research field. These processes provide evidence from diverse perspectives by means of contributions to the body of knowledge in the field of educational technology.

Mobile technology, learners' locations and transformations of educational materials are being transferred and shared via learners' devices. In developing a theory of learning for a mobile age, Sharples, Taylor and Vavoula (2007) describe four criteria:

- *A theory of mobile learning must distinguish what is special about mobile learning compared to other types of learning activity.*
- *A theory of mobile learning must embrace the considerable learning that occurs outside offices, classrooms and lecture halls.*
- *A theory of learning must be based on contemporary accounts of practices that enable successful learning.*

- *A theory of mobile learning must take account of the ubiquitous use of personal and shared technology (Sharples, Taylor & Vavoula, 2007:2-3).*

Moreover, chapter 3 of this thesis address a definition of mobile learning as a conceptual framework that mobile learning based on mobility of technology, mobility of learners and mobility of learning.

To adapt these criteria to this study, the research assumes that there are two types of learning in Higher Education – conversational learning and distance learning. The first is more formal and takes place in confined areas such as classrooms, lecture halls and laboratories. The learning environment is very contained in terms of time and place. The second type of learning is more informal and takes place by extending the learning space to many locations. Distance learning includes e-learning, open learning, and virtual reality (VR) learning. An expansion of the learning space in Higher Education is necessary as the formal learning available at university campuses is not sufficient for the huge number of people who want to learn. Universities first expanded their campuses, and then they developed web-based learning projects to connect people online. The challenge for universities is that an increasing number of people seek education but there are too few trained lecturers, and the entire landscape of Higher Education is expanding with the availability of information and wireless education in the digital era.

This thesis assumes that mobile learning can be formal, informal, conversational, or at a distance, and includes also e-learning. The mobility of learners and learning technology has to be taken into account by universities. The questions arise as to how mobility will fit in with the various learning approaches and where mobile technologies will contribute to learning in Higher Education. The thesis discusses the relationships between mobile devices in social life and learning, both informal and formal and how these interact with Higher Education.

4.3 Qualitative research as a design choice

To develop a suitable research design for this thesis, I relied on combinations of theories that focus on the analysis of changing ways of thinking. Although all research methods are a set of procedures and techniques for gathering and analysing data (Strauss & Corbin, 1990), qualitative research could be described as a 'pragmatic' approach with a more 'structured' attitude. It prescribes the use of a set of analytical tools and guiding principles. Here, the researcher is encouraged to mix grounded theory with other methodologies, and to apply existing insights and experience to the

subject matter where appropriate (Strauss & Corbin, 1990). It also refers to basic principles and philosophical assumptions underpinning different research paradigms. The research design for this thesis is, therefore, a way of thinking about and studying social reality (Strauss & Corbin, 1990), and a methodology of qualitative research is used. In this thesis, the research instrument was interviews with experts and participants in the field of mobile learning. A qualitative research methodology was used in this study because human beings play a significant role in shaping their communities. They are politically and socially conscious and constantly contributing to the transformative processes in their communities. In this case, they are strategic partners because they provide space and case studies for academic enquiry. (Charmaz 2006:7)

4.4 Grounded theory as a research approach

This research is designed according to the grounded theory of qualitative research methodology proposed by Glaser and Strauss (1967), Strauss and Corbin (1990) and Charmaz (2006). Glaser and Strauss (1967) represent grounded theory as a positivist view that deals with objective external reality and a neutral observer who discovers data and applies systematic analysis. This positions the grounded theory approach as prescriptive and structured. For Glaser and Strauss, the theory is also related to post-positivism because it gives a voice to the participants, uncovering how their views and perceptions differ from the researcher's views. On the other hand, Charmaz (2006) claims constructive grounded theory takes the middle ground between postmodernism and positivism. She assumes, as does this research, that the relativism of multiple social realities recognises the mutual creation of knowledge by the researcher and the researched (Charmaz, 2006). I, however, have used the tools of grounded theory without embracing positivism. This implies that the theory enforces the views, values, feelings, assumptions and ideologies of the individuals, as well as those of the researcher rather than the methods of research.

This thesis adopted the methodology developed by Strauss and Corbin as reaction against the extremes of positivism that have permeated most social research. These theorists position grounded theory as a practical method for conducting research which focuses on the interpretive process by analysing the actual production of meanings and concepts used by social actors in real settings (Strauss & Corbin, 1990). For Strauss & Corbin, the development of new theory should involve negotiating the different interpretation of the human realities. It is premised on the way human beings make meanings of situations through lived experiences.

This rejects positivist notions and hypothesis testing. To this end, I subscribe to an organic process of theory emergence based on how well data fits conceptual categories identified by a researcher and how well the categories explain or predict ongoing exploring and interpretations as well as the relevance of the categories of the core issues being observed (Suddaby, 2006:30).

This research also draws on Charmaz who defines grounded theory as an inductive, comparative, and interactive approach to inquiry that offers several open-ended strategies for conducting emergent inquiry. This research paradigm was used to develop the properties of categories until no new properties emerged. The grounded theory approach is therefore a very flexible approach taking into account the loop, nonlinear and endless processes of the approach (Charmaz, 2006). However, grounded theory is essentially about continuous investigation and analysis of phenomena, constantly searching for new evidence. The value of this approach is therefore the quality of data, which emerges out of this incessant quest for new evidence (Strauss & Corbin 1990; Charmaz, 2006; Creswell, 2007).

Premature departure from the field may result in data which is not only partly analysed but which also fails to elevate obvious categorisations to more abstract theoretical positions. In this study, the researcher worked with participants by interviewing mobile learning content experts about their projects before undertaking generalisation. The researcher describes in detail the context of the study, and uses field experiences to continually revise more research questions (Creswell, 2007).

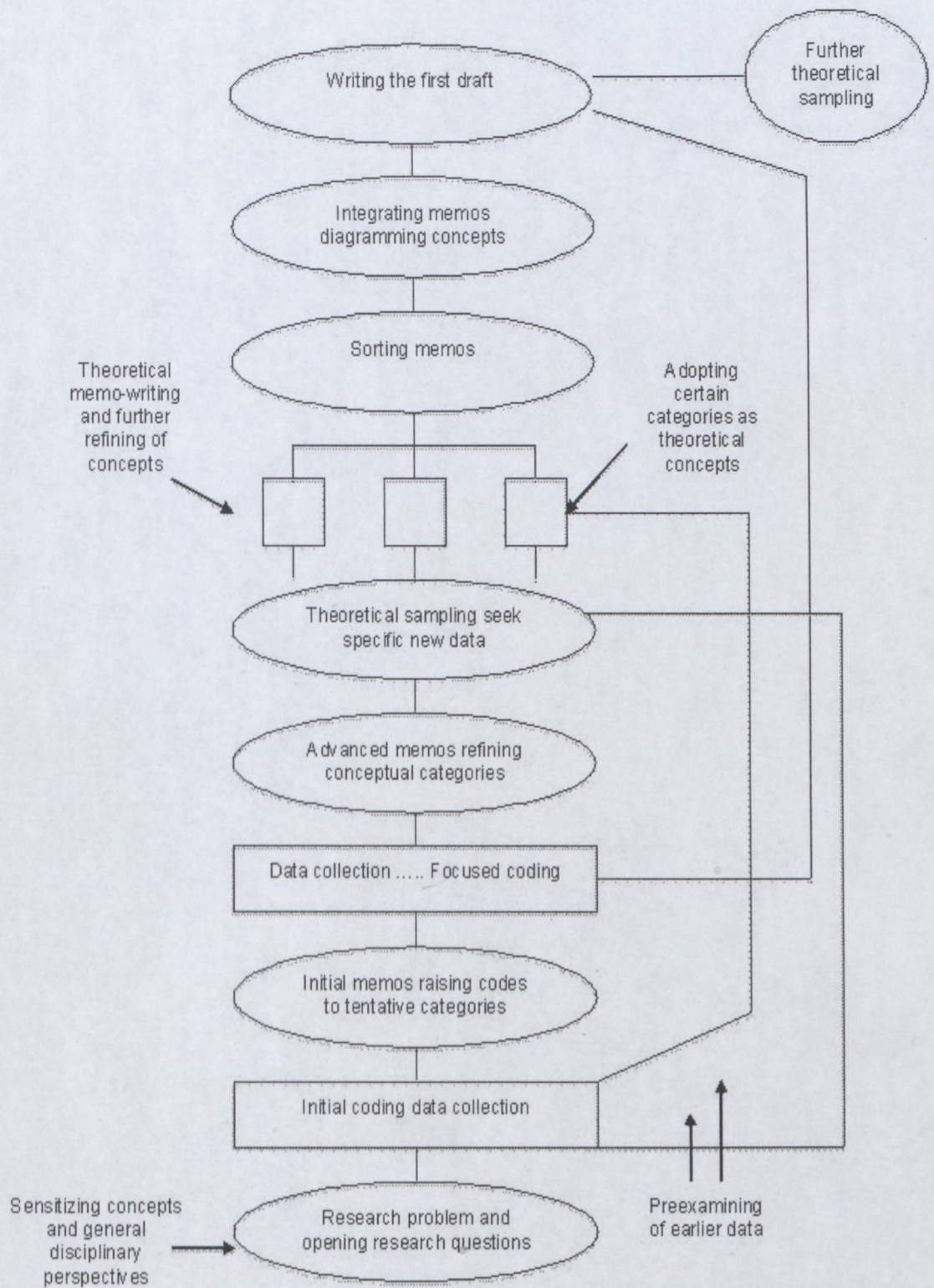


Figure 8: The grounded theory process

(Adapted from Charmaz, 2006:11)

4.5 Data collection: procedures and techniques

To collect data, I read and analysed the literature and documents pertaining to the processes of mobile learning and interviewed participants and experts. I used this approach because theory and reality cannot be handled as epistemology in the usual way of researching phenomenon. Rather than using that approach, my research subscribes to the modern view of the social reality of theory building. Theory builders should be able to break down the relationship between theory and reality, especially in the context of the social sciences. Moreover, the research hopes to move away from the actual methodological field to suggest multi-disciplinary epistemological assumptions although the methods of data collection and analysis relate to a single epistemological assumption (Boote & Beile, 2005). Charmaz (2006), however, describes the grounded theory approach as a 'data dance', and a 'zigzag' way of collecting and analysing data.

In the next section of this chapter I will clarify how the methods of grounded theory are addressed in this study. The zigzag approach is simply advanced diagrams for describing, explaining, and writing a family tree and a social structure in the social research disciplines. It is "inductively derived from the study of the phenomenon it represents. It discovers, develops and provisionally verifies through systematic data collection and analysis of data pertaining to that phenomenon. Data collection, analysis and theory are reciprocally related to each other" (Strauss & Corbin, 1990:23). The grounded theory 'data dance' is an appropriate method that indicates continuing processes and the marriage between the real worlds of the research and the researcher. This process includes collecting, categorising, analysing and writing up research data (Figure 4.9).

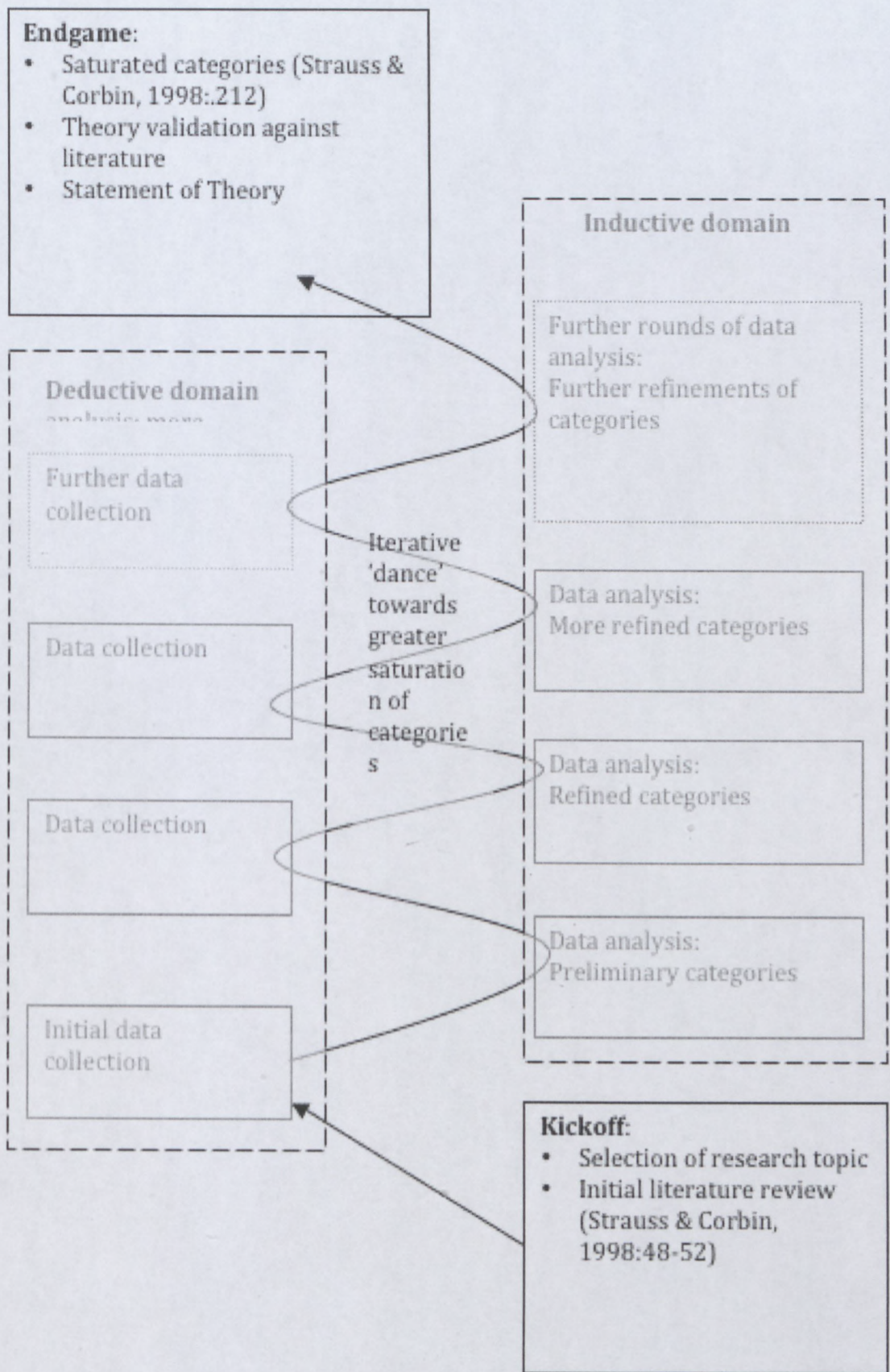


Figure: 4.9: The grounded theory 'data dance'

(Adapted from Kelsey, 2003)

These criteria form the main research assumption for this study and the research was then conducted accordingly, as discussed below.

4.6 The research matrix

The research matrix combines the research questions with the research instruments used for data collection. This matrix focuses on the main research question: How must theories be revised to interpret the change in the mobile learning context?

Table: 4.10 The research matrix

Research questions	Instruments		
	Literature analysis	Interviews	Document analysis
Sub-question 1: How does learning with mobile technologies differ from learning with other learning media and approaches in Higher Education?		✓	✓
Sub-question 2: How does the current pattern of learning with technology changing as a result of the introduction of mobile learning technology/learning in the Higher Education landscape?	✓	✓	
Sub-question 3: What are the implications of mobile learning for Higher Education in the context of learning theory and instructional design theory?	✓		✓

4.7 Research methods

Based on the research matrix, the research methods in this thesis refer to the research instruments, techniques and procedures used to collect and analyse data from the field as a 'loop' situation in order to answer the research questions.

Sub-question 1: What are the implications of mobile learning for Higher Education in the context of learning theory and instructional design theory?

This question drove the literature survey. To answer this question, I collected data from the literature and other documents. The aim of the data collection process was to explore mobile learning in the context of learning and instructional design theories in Higher Education in order to clarify theories that are applicable to mobile learning.

Sub-question 2: How does learning with mobile technologies differ from learning with other learning media and approaches in Higher Education?

Sub-question 3: How does the current pattern of learning with technology changing as a result of the introduction of mobile learning technology/learning in the Higher Education landscape?

To answer these questions I conducted interviews with experts in the field of mobile learning. These interviews aimed to compare learning with mobile devices to learning with other learning media, in order to explore how mobile learning interacts with other learning media and approaches.

4.7.1 Literature and documents

To search for relevant written material, I ran web searches of recent scholarly journals and discussion forums using broad terms such as 'mobile learning', 'e-learning', 'learning theories', 'philosophies' and 'educational technology'. Documents are tangible manifestations of people's experience, knowledge, actions, and values. For Nieuwenhuis (2007a), data gathering focuses on all types of written communications that may shed light on the phenomenon, which is being investigated. Written data sources include published and unpublished documents, reports, journals' articles, or any other documents that are connected to the subject of the investigation. Analysis of these resources was therefore based on thematic analysis of the written literature.

In order to examine the methodologies used by previous researchers in this field, I conducted an online search of the international journals that are devoted to mobile learning. The criteria that I used to select journal articles and other texts for this study were simple: the extent to which the article or text succeeded in explaining and describing how mobile learning is growing in visibility and how it is acquiring an incremental importance in Higher Education practice throughout the developed world. The most important ones are described in the following tables:

Table 4.11: Sample of results of web searches to find the most important journals dealing with mobile learning

Name of journal	Rationale	URL
International Journal of Interactive Mobile Technologies (IJIM)	It is the purpose of the International Journal of Interactive Mobile Technologies to describe the most recent trends and research happening in this area.	http://www.online-journals.org/index.php/ijim
International Journal of Mobile Learning and Organisation (IJMLO)	The International Journal of Mobile Learning and Organisation (IJMLO) is a refereed, multidisciplinary journal for describing the latest advances in mobile learning and organisation.	http://www.inderscience.com/browse/index.php?journalCODE=ijmlo
International Journal of Mobile Communications (IJMC)	The International Journal of Mobile Communications (IJMC) to help professionals who are working in this field, namely academic educators and policy-makers, to contribute, to disseminate knowledge, and to learn from one another.	https://www.inderscience.com/browse/index.php?journalID=40

A central objective of this study was to scrutinise the literature in search of elements that could contribute to clarifying the theoretical characteristics of learning. Methodologically, the data collection was based on a review of the literature in the fields of educational psychology, sociology and emerging educational technologies, viewed in conjunction with changes in society. The process of data collection was based on the following structure because it combines the research questions and objectives with data collection. McMillan and Schumacher (2001) point out those interactive data collection strategies are used primarily in the study of current social happenings and processes.

Table 4.12: Results of web searches when looking at conferences on mobile learning

Name of conference	Rationale	URL
The Conference Proceedings of MLEARN 2004. The theme of this conference was "Learning anytime everywhere".	The conference speakers and delegates included practitioners, the designers of mobile learning materials and services, hardware and software technology developers, and researchers from mobile learning projects that are being implemented around the globe	http://www.mobilelearn.org/mlearn2004/
2005 4th World Conference on Mlearning. The theme of the conference was "Mobile technology: The future of learning in your hands".	This annual conference is the key research and networking event for researchers, strategists, educators, technologists and practitioners in the field of mobile learning from all over the world.	http://www.mlearn.org.za/
The 5th World Conference on Mobile Learning, 2006	The purpose of this conference was to stimulate critical debate and research into the theories, approaches, principles and applications of mobile devices for promoting learning.	http://auspace.athabasca.ca:8080/dspace/handle/2149/1145
International Conference Mobile Learning 2007 Lisbon, Portugal 5-7 July 2007	This conference was designed in improving learning, designing content and developing systems that are especially suited to mobile devices and wireless networks.	http://www.mlearn2007.org/
International Conference Mobile Learning 2008 Algarve, Portugal 11-13 April 2008	The aim of the conference was to understand mobile learning from the learner mobility.	http://www.mlearning-conf.org/2008/
International Conference Mobile Learning 2009 Barcelona, Spain 26 - 28 February 2009	The aim of the conference was to explore the transition from content consumer to content creator.	http://www.mlearning-conf.org/2009/
International Conference Mobile Learning 2010 Porto, Portugal 19 - 21 March 2010	The conference contributions under several topics, which illustrate developments in the field of mobile learning.	http://www.mlearning-conf.org/2010/

Table 4.12 consists of sample of part of conferences about mobile learning that enlightened the research. However, mobile learning conferences 2002-2007 were a crucial birth of the most topical of mobile learning today. Most of the articles about

mobile learning in those academic conferences are by now published journals article that described research in terms of theoretical and practicalities of mobile learning.

It was necessary for the researcher to read and reflect on all these documents to be able to draw conclusions about what is happening in mobile learning, suggest relationships and connections between the ideas and information encountered in the literature, and to explicate the current relationships between theory and practice in this field. Therefore, the overall purpose of this thesis is ultimately to define and explain the contemporary position of mobile learning in the field of Higher Education as it was in 2002-2007 but not in 2008-2011.

The simple process of reading and critically analysing this literature is as follows:

- To locate the underlying assumption behind the research problem (paradigm; how the researcher sees the world).
- To review and critique previous research, methods and scholarly writing that relates to the research question and research discipline.
- To identify gaps in the literature.
- To refine and redefine the research questions further.

For the literature analysis I selected resources from the current literature base of international academic journals in the field of educational technology. The criterion for selecting these journals was their 'impact factor' as the most published and cited journals in the field. "The impact factor is a scientific criterion as it is an index based on the frequency with which a journal's articles are cited in scientific publications. It is therefore is a putative marker of journal quality" (Saha, Saint & Christakis, 2003:42).

I reviewed three aspects of the research literature on technology, pedagogy of teaching and learning, and instructional design, with a focus on instructional technology:

- Different types of mobile technology in 2004-2007 conference papers,
- The contexts of instructional design and learners locations.
- Teaching and learning contexts.

These three areas locate existing literature in a very broad historical context of scholarly resources. They do not only reflect the assumptions made in the obtainable literature but also enhance the understanding of theoretical assumptions from a critical reading of previous research methods. A limitation of this time frame is that

certain mobile technologies such as “tablets” were not yet in general use. Nevertheless I argue that my study concerns aspects of mobility, rather than specific mobile devices.

Hence, the review of important literature on regulatory change or new products is followed by a moderated, live, online, peer-to-peer discussion of the material’s applicability to the author’s writing and readers’ interpretations. Boote and Beile (2005) opine that doctoral research aims to establish a link between methodology and the literature review. However, I have not ignored the literature; rather I have used it as a source of data for my research because literature provides rich conceptual frameworks for any empirical study. Moreover, analysis of existing knowledge on any research topic, test the researcher’s ability to critically interrogate different schools of thought on the topic and bring them to bear on their research objectives (Glaser & Strauss, 1967; Boote & Beile, 2005).

From the above-mentioned quotation, it means that the nature of complex knowledge building in the era of mobile learning is growing faster than ever before. This development will infuse my research plan with multidisciplinary knowledge rather than just aiming for a sophisticated literature review in the education discipline.

Significantly, the original grounded theorists argued against reading literature on other theories before collecting and analysing data because this could ‘contaminate’ the analysis with ideas and concepts that may not be appropriate to the field being investigated (Glaser & Strauss, 1967). This includes “critical content analyses of the main literature of grounded theory ‘constructivist-objectivist grounded theory’” (Charmaz 2006: 166). For this study, it was necessary to find relations between the evolving theory and the current literature, and connect them to the research discipline in order to improve theory building.

However, “a common misassumption is that grounded theory requires a researcher to enter the field without any knowledge of prior research” (Suddaby, 2006:634). This is referred to in the writings of other authors. Strauss and Corbin (1990) see the use of literature as the basis of professional knowledge and refer to it as literature sensitivity. They see it as “accumulated knowledge”. I read and analysed documents such as old conference proceedings and journal articles in an attempt to compare and explain the changes that are taking place with the move from electronic learning to mobile learning.

Van Dijk (1993:250) indicates that an analytical and sophisticated reading of the literature “may examine the style, rhetoric or meaning of texts for strategies that aim at the concealment of social power relations, for instance by playing down, leaving implicit or understating responsible agency of powerful social actors in the events represented in the text” (1993:250). Drawing on this method, I analysed the data from current literature as a way of understanding learning theories and instructional design theories for mobile learning. This approach sought to investigate the theories and the gaps in mobile learning, to understand mobile learning’s position in the Higher Education landscape.

The method of finding a research problem, and part of the research findings, was based on a literature citation analysis obtained from a reading of the current literature. This analysis was built on the basic concepts of educational theory and practice of technology, and learning and instructional design theories.

Table 4.13: Example of selecting literature analysis sources according to the journal impact factor

Journals	Criteria	Impact factor	URL
Educational technology and society	The aim of the Journal of Educational Technology & Society is to help the developers of educational systems and educators who implement and manage such systems to better understand each other's role in the overall process of education and how they may support each other.	0.904 according to 2008 Thomson Reuters Journal Citation Report.	http://www.ifts.info/
Educational technology research and development	Educational Technology Research and Development is the only scholarly journal in the field of educational technology focusing entirely on research and development. The Research Section assigns highest priority in reviewing manuscripts to rigorous original quantitative, qualitative, or mixed methods studies on topics relating to applications of technology or instructional design in educational settings. The Development Section publishes research on planning, implementation, evaluation and management of a variety of instructional technologies and learning environments. Empirically-based formative evaluations and theoretically-based instructional	0.695 according to 2008 Thomson Reuters Journal Citation Report.	http://www.springerlink.com/content/119965/

	design research papers are welcome, as are papers that report outcomes of innovative approaches in applying technology to instructional development.		
--	--	--	--

Though several journals were included in the literature analysis, I concentrated on two well-known journals in the field of educational technology – the Journal of Educational Technology and Society, and the Journal of Educational Technology Research and Development – from 2007 to 2011. The reason for selecting these two journals was that they have high impact factors according to Thomson Reuters Scientific Journal Citations Report that appears on the journals' web sites. Hence, citation analysis proved that these journals are leaders in the field of international educational technology research and development. The selection method for categorising journals is scientific and by no means perfect, but I used their criteria to support my decisions and arguments in the analysis process.

Literature citation analysis started as a result of the need for assessment of the content and context of educational technology reports, which change over time according to the literature. The analysis categorises and highlights the potential of innovative multiple learning and instructional design theories for advancing the development of educational technology research. The two general concepts and processes – education and technology – are linked in an attempt to understand the educational theory concepts (theoretical clusters of current learning and instructional design theories – theory) and those of the technology concepts (activities supported by technology – practice).

This method does not argue in support of either traditional pedagogical methods or educational theories, but rather it addresses changes and shifts in the study area. It tell a success story of how those have altered and shifted over the past years since 2007 and includes a self-reading reflection of past, current and future expectations.

4.7.2 Interviews

For this project, I interviewed experts and stakeholders including those using mobile devices in teaching, learning and instruction. Based on the conceptual framework in chapter 3, the interviews consisted of three aspects: thinking aloud about mobility of technology, mobility of learners, and mobility of learning. I designed unstructured interviews and used them to obtain personal information from the expert participants in the interviews. I investigated the natural context of mobile learning – at multiple

locations and times – in order to facilitate easy explanations of mobile learning and technology that might be a usual part of those learning, teaching and design processes.

The experts and stakeholders are experienced in the use of mobile devices in teaching, learning and instruction. For these reasons, I personally conducted the research as a participating observer. I interviewed five experts in the field of mobile learning in South African context: two male and one female from Gauteng, and one male and one female from the Western Cape. The first interviewee uses mobile devices to teach. Her students use PDAs to record their fieldwork and then they create a PowerPoint slide show and discuss their work further. The second interviewee is a well-known theorist in the field of mobile learning in South African Higher Education; he is principal of a private college. The third one is a consultant to the education department, and is an expert in the field of e-learning. The fourth one is a female from the educational department in one of the South African provinces; she is an expert in the field of m-learning. The fifth one is a designer and lecturer at a private design college in the Western Cape. Those experts are famous in the field of mobile learning in South Africa. However, the research was done in South African Higher Educational institutions.

Interviews with experts illuminated problems and broke down assumptions about their work and current technology, and also drew together different viewpoints from teacher and student, or manager and employee. I expected that experts would often, but not always, be able to articulate their work methods in words. Their basis for making decisions would shape the ways in which they structure and deploy knowledge and skills. A qualitative interview was combined with a detailed, descriptive recording of notes of events, people, actions and objects in settings. I used participant interviews for my data collection. During the interview process the interviewees described the learning styles and what, how, when, why and how much they use mobile devices for learning/teaching purposes.

During the interview, I asked the experts to talk freely about their own experience of mobile learning. The data obtained from the interviews helped me to understand what interviewees think of mobile learning. They provided some approaches that are part of the learning process such as the new theory proposed in this thesis.

It is therefore difficult to understand why categories derived from interviewees' responses must be discussed with other categories or interlinked with other

interviews and literature in an analytical method for answering the same research questions. The interview questions were intended to provide an understanding of how the three emergent concepts of mobile learning are conducted theoretically and practically in the field without any bias. The experts were each interviewed once about the three concepts: mobility of technology, mobility of learner, and mobility of learning. The data was collected through open-ended interviews, which were tape recorded and transcribed later. In the splendour journey of evolving, where interviewing was my goal to discover the depths of 'data saturation' (Charmaz, 2006:96), by the fifth one I strongly imbibed into my mind that there was a pretty-constant repetition existed.

4.8 Data analysis

Allan (2003) claims, "a fundamental part of the analysis method in grounded theory is the derivation of codes, concepts and categories". This means that "in grounded theory the analyst just lets concepts emerge and their theoretical codes emerge, which become hypotheses- induction- and then maybe for theoretical sampling, conceptually elaborates a bit to get more data on a thin area through more data collection" (Glaser, 1992). In contrast, Charmaz contends that Glaser, in his 'purist' claim on the dominant importance of professional simplicity, "assumes that we can gather our data unfettered by bias or biography". She also critiques Strauss and Corbin's guidelines as "didactic and prescriptive rather than emergent and interactive" (Charmaz, 2000:522-4). She advocates a 'constructivist' adaptation to grounded theory rather than grounded theory between the post-modern and the post-positivist positions.

The data analysis strategies included three steps adopted from Vithal and Jansen (1997:27-28):

- *Scanning and cleaning the data, which is require to prepare it for analysis by:*
 - ✓ *Reading the data from the literature and interviews.*
 - ✓ *Checking for incomplete, inaccurate, inconsistent or irrelevant data from conference proceedings and journal articles by memo writing.*
 - ✓ *Identifying preliminary categories, themes and trends in the scanned data to facilitate the organisation into meaningful interpretation by comparing the data from the first step.*

- *Organising the data to make sense of the information by arranging it in meaningful forms:*
 - ✓ *Assessing the use and usability of mobile learning in Higher Education by who uses or agrees to use mobile devices for teaching, learning and instructional purposes.*
 - ✓ *Comparing the responses of interviewees about learning with mobile devices during interviews in the field.*
 - ✓ *Describing how learners and teachers interact using mobile devices in Higher Education and what the learning processes are.*
 - ✓ *Categorising the current patterns of learning technology in the Higher Education landscape.*

- *Presenting the analysis results in the form of core elements of qualitative research methodology such as data graphs, tables and charts.*

4.8.1 Thematic concepts and document analysis

Grounded theory is a flexible research methodology that allows using multiple methods to collect and analyse data. However, a thematic analysis of the literature on learning theories reveals that there is no single theory that stands on its own to describe and draw together relevant principles for all learning processes. Most of the books describe more than one theory of learning, meaning there is no definitive 'bible' of learning theory. In order to illustrate this, I drew together a collection of underlying theories with the characteristics, elements, principles and views of theorists that could enhance our understanding of the way individual and social interactions contribute to the learning process. This method allowed the researcher to critique, analyse and draw some sort of conclusions that might shed some light on a possible theory for mobile learning in the Higher Education context.

This method is "generated by themes, and themes emerge from data during analysis, capturing the essence of meaning or experience drawn from varied situations and contexts" (Bowen, 2006:1). The collection and analysis of qualitative data involves critical engagement with corpuses of empirical evidence. It is an intense mental activity, which requires meticulous interrogation of subjective data from, multiplies sources. The researcher is therefore the critical thinker during this journey because he/she has to engage "in an intensive learning process where new knowledge and information is achieved" (Krauss 2005: 763).

Thematic analysis also involves the search for and identification of common threads in the interview or set of interviews. Themes are usually quite abstract and therefore difficult to identify. Often the theme does not immediately 'jump out' of the interview but may be more apparent if the researcher steps back and considers (Morse & Field, 1995, Bowen, 2006:2). A theme may be beneath the surface of the interview, but once identified, it appears obvious. Frequently, these themes are concepts indicated by the data rather than concrete entities directly described by the participants ... once identified, the themes appear to be significant concepts that link substantial portions of the interviews together (Morse & Field, 1995). Bowen (2006) indicates that "a variety of data sources may be tapped in a grounded theory study. As the researcher analyses the data, major themes are expected to emerge and... categorised in such a way that they produce a theory" (2).

4.9 Validity and reliability of data

3.9.1 Validity

Validity is an epistemological concern about the way a researcher collects data. McMillan and Schumacher (2001:20) indicate that "validity means the degree to which scientific explanations of phenomena match the realities of the world. Validity refers to the truth or falsity of propositions generated by research. Explanations about observed phenomena, approximate what is reality or truth, and the degree to which the explanations are accurate comprises the validity of the research". For this research I triangulated the data by using three different instruments to collect the data: observation, interviews and analysis of documents and artefacts. I compared the data from these instruments to be sure of the data triangulation. The arguments drew on a deep understanding of mobile learning in Higher Education within current learning and instructional design theories.

This suggests that "validity is an attempt to 'check out' whether the meaning and interpretation of an event is sound or whether a particular measure is an accurate reflection of what you intend to find out" (Vithal & Jansen, 1997:32). In this study, the subjectivities of the researcher and those studied are part of the research process. My primary responsibility was to reflect on interviewees' actions and my observations in the field. "Their impressions, irritations and feelings became data, forming part of the interpretation, and they were documented in research diaries. It is a value-laden inquiry" (Ashworth, 2003).

The validity of the research is reinforced by triangulations confirming the trustworthiness of the writer and researcher. In response to this, the researcher used multiple methods and research instruments to collect the data in order to find the essence of the research. However, I chose a number of ways to validate the research data by:

- Comparing findings from the observations with the findings from interviews, documents and artefacts.
- Returning the draft report to the respondents for an accuracy check.
- Doing multiple readings of the same event.

As the researcher, I questioned aspects of the construction of reality. I believe that science cannot solve the problems of society. Science needs to be reflexive about its limitations in order to break down what had been written before on mobile learning.

4.9.2 Reliability

The measurements of research data and their explanation should be reliable. "Reliability is about the consistency of a measure, score or rating ... reliability is used more often in statistical studies and less frequently in qualitative studies where other standards of validation and consistency are typically sought" (Vithal & Jansen, 1997:33). For the purpose of analysing the data of this qualitative study, reliability stems from:

- Interviewing more than one expert to ensure that interviews make sense for information trustworthiness.
- Analysing various documents and artefacts.

I analysed data to disassemble or 'deconstruct' some of the texts in a specific theoretical language, aiming to look at the contradictions, ambiguities and theory agendas. These stories were used to reconstruct knowledge as partial rather than valid and reliable values.

4.10 Ethical considerations

The study conformed to the ethical standards of the existing learning theories and instructional design theories for mobile devices used in the Higher Education landscape and accessible to educators, researchers and stakeholders. I interviewed experts who use mobile devices in learning and teaching. These stakeholders were

experienced individuals in the field of mobile learning. The participants were older than 18 years of age. Hence, conformation is given that the data collected for the study will do no harm to anyone concerned. Furthermore, participation in my research was voluntary. No incentives were offered, as the research was academic in nature.

Before the interviews, a confidentiality agreement was signed which permitted the researcher to use the information obtained. This agreement prohibited the disclosure of respondents' names in this thesis. Interview questions were limited to aspects such as implications, effectiveness, theoretical foundations and respondents' views on mobile learning. The questions did not address participants' personal lives. Interviews with the experts in the field lasted between 30 and 90 minutes on average. A detailed description of the research objectives was given. It was emphasised that the research was for academic purposes. No bias was intended by the researcher, and the respondents were at no risk of physical, psychological, legal or social harm stemming from their participation in the data collection process.

Participants who understand the theoretical claims about mobile learning, and educators were provided with an opportunity to access the learning and instructional design theory that is relevant to mobile learning, particularly as I explained the objectives of the research to the participants. However, one point "most qualitative researchers tout as a major epistemological advantage of what they do, is that the qualitative approach allows them to grasp the point of view of the respondent. This satisfies what they regard as a crucial criterion of adequate social science. It also means, "taking the point of view of the other" – a wonderful example of the variety of meanings methodological slogans acquire" (Krauss, 2005:764). My research offered confidentiality and anonymity to the participants involved, as I did not attach any names to the information they shared with me. Depending on the interests of individual respondents, I will give those participants who explicitly asked for it, feedback on the outcomes of my research, with the permission of the Cape Peninsula University of Technology, after I have presented my research report.

The article in Chapter 3 was included in this thesis with the permission of the editor of the journal of Educational Technology and Society in which it first appeared. The article's format and style were changed to match the Cape Peninsula University of Technology's technical thesis format.

The research deals with both sides of the ethical considerations of media and technology, and deontological ethical issues. Bird and Stubbs (2008) state that there

is some concern about ethical and legal issues that might arise from the use of mobile technology. When a university provides a mobile and wireless environment, it may be required to take legal action if students use the systems to abuse or bully staff members or each other. There is nothing to prevent current technology such as email being abused in this way but the instantaneous nature and personal access granted by mobile technology may make this potentially more frequent and more damaging to individuals. This is an issue that might concern university boards and ethics committees when deciding whether to accept this form of technology into their environment. Examples were cited of SMS-based bullying by teenagers in schools and personal criticism of lecturers in Higher Education institutions via Facebook. However, some respondents felt that it is just a new but inevitable risk that must be weighed against the benefits. This specific issue does not seem to have an obvious equivalent in the innovation literature. Several respondents fear that universities will establish new ethics committees to look at these issues, thus creating a further barrier to progress.

4.11 Conclusions

This research pursued a qualitative research methodology, namely understanding the theoretical design and practical processes and experiences of how people learn with mobile technologies among current learning and instructional design theories. By collecting data in the field, the researcher brings the worldviews, paradigms, or sets of beliefs of the participants to the research project. By analysing data, the researcher uses interpretative and theoretical frameworks to further shape the study. It has emerged from this chapter that grounded theory is a flexible research methodology that allows for multi-disciplinary methods and research instruments to be added. It concludes that the grounded theory method is recommended as a powerful way to collect and analyse data and draw meaningful conclusions. The grounded theory 'data dance' is an appropriate method that indicates continuing processes and a marriage between the real world of the research and the researcher. This process includes collecting, analysing, categorising, analysing and writing up research data.

CHAPTER 5

DISCUSSION OF FINDINGS: THE SIGNS OF MOBILE LEARNING DEVELOPMENT

The development of mobile and wireless technology has led to considerable changes in the use of technology in Higher Education. Technological shifts create alternations of technological push and learning demand (pull). Learning and instructional design theories, emerging interpretations and practical learning methods have provided new opportunities for people to learn. In this chapter, the existing state of learning technologies is described and analysed using data from five interviews. The descriptions and analyses seek to respond to the following research questions:

- *How does learning with mobile technologies differ from learning with other learning media and approaches?*
- *How does the current pattern of learning with technology change as a result of the introduction of mobile learning technology (m-learning) in the Higher Education landscape?*

The discussions presented in this chapter are based on the premise that mobile learning is not about the mobile technology itself; mobile learning (like all learning) is about the learner and the learning experience. Mobile technology is simply a means of providing more flexibility and mobility and is not the key instrument in the learning process. It is the medium for delivery of instruction and support of the learning process. This means that educators and instructional designers possibly regard these technologies as tools, not as the main focus of instruction. Mobile learning technologies may have signs of learning, which enable the transfer of learning materials between the device and the learner, with the medium playing the role of mobilising learners, learning, and instruction.

In Chapter 3, I defined mobile learning in order to build a conceptual framework for this study. The conceptual framework is based on the mobility of technology, mobility of learners, and mobility of learning (El-Hussein & Cronjé, 2010). Chapter 4 discussed the research design, methodology and methods, in particular the qualitative grounded theory approach used in this study. Grounded theory is applied in the form of a 'loop'—a 'data dance' between collecting and analysing data, and discussing and presenting the research findings. Chapter 4 also documented the interview process and the

collection of data from interviews. Drawing on these discussions, this chapter presents the research findings, which emerge primarily out of analyses of the data collected from interviews with five experts in specific Higher Education institutions in South Africa, who were selected according to their significant contributions to the field of mobile learning. In order to maximise the quality of the data and in accordance with the emergent concepts of mobility of technology, mobility of learners and mobility of learning as presented in the conceptual model, each interview consisted of three sections of mobility of technology, mobility of learner and mobility of learning (El-Hussein & Cronjé, 2010). Five interviews 30 minutes each. All the interviews took place in South Africa, in the cities of Cape Town and Pretoria. Before the interviews took place, a confidentiality agreement was signed, which permits the researcher to use the information provided for the purposes of this study. This agreement prohibits the disclosure of respondents' names in this thesis. Instead they are referred to by using respondent 1, 2, 3, 4 and 5. Only five respondents were selected, as data saturation occurred.

In the following sections I analyse the mobile learning experiences of several institutions: a university of technology, as governmental institute and two graduate private institutions. This strategy seeks to triangulate and crystallise the data gathered from the mobile learning initiatives in various different Higher Education institutions. A total of five experts in the field of mobile learning/technology were interviewed with a focus on the emergent concepts of mobility of technology, mobility of learners and mobility of learning. During the interviews, each respondent described mobile learning from his/her personal point of view and their own experience.

According to the conceptual framework that was built in chapter three, the findings are divided into the three interrelated sections: mobility of technology, mobility of learners, and mobility of learning.

Table 5.14: Conceptualisations of mobility of technology, learners and learning (Adopted from El-Hussein & Cronjé, 2010:12-21)

Concepts	Mobility of technology	Mobility of learners	Mobility of learning
Physical space	Light and portable	Can go where they want to	Does not have boundaries
Actual movement	Can be moved easily from place to place	Can move freely and loosely	Learning can take place inside and outside
Admin	Can be collected and issued, Mobile devices on loan	Can be reached for absent part of instruction	Can be transferred from admin to learner devices
Learning	Unrestricted learning space	Depends on learners' locations	Unlimited resources and access
Pedagogy	Can be used as teaching machine, technology can enhance learning	Communities of practice and participation	Integrated in whole process: media and resources

SECTION 1

IMPLICATIONS OF THE MOBILITY OF TECHNOLOGY

5.1.1 Introduction

This section aims to explore the implications of the mobility of technology in the Higher Education landscape. In Higher Education institutions, the use of technology is intended to support and enhance teaching and learning. Simultaneously, lecturers and learners are encouraged to use various technologies as part of their everyday instructional and learning activities. These activities may include the use of Learning Management Systems (LMSs) such as Blackboard, e-testing, video-conferencing, video-recordings and multimedia applications (Alessi & Trollip, 2001) – all of which constitute various media embraced by the term *e-learning*. Recently cellular and handheld devices (see list below) are emerging as mobile technologies that can be added to this list of e-learning media.

The mobility of technology refers, as stated in chapter three, to the use of advanced cellular or mobile technologies, which include Personal Digital Assistants (PDAs), 'smart' phones, digital cameras, iPods and iPhones. These advanced mobile devices are furnished with Wireless Application Protocol (WAP) or Wireless Fidelity (Wi-Fi) capacities, which allow the user to connect to the Internet (El-Hussein & Cronjé, 2010).

This section discusses eight issues regarding the mobility of technology:

1. Use and usability
2. Management
3. Technical support
4. Learner motivation
5. Staying online
6. The disaffected learner
7. Instructional design
8. Pedagogical approaches

Underlying these eight issues (which are discussed in the sections that follow), Koole (2009:28) emphasises the fact that mobile devices are equipped with physical, technical, and functional features. The physical features include input and output capabilities, internal components such as storage capabilities, power, processor

speed, compatibility, and expandability. These components “impact significantly on the physical and psychological comfort levels of the users. It is important to assess these characteristics because mobile learning devices provide the interface between the mobile learner and the learning task(s) they perform” (28). This device-usability intersection is described in the following sub-section of the chapter.

Table 5.15: Physical features of mobile devices

(Adapted from Koole, 2009:28-29)

Criteria	Examples & Concepts	Comments
Physical Characteristics	Size, weight, composition, placement of buttons and keys, right/left handed requirements, one or two-hand operability.	Affects how the user can manipulate the device and move around while using it.
Input Capabilities	Keyboard, mouse, light pen, pen/stylus, touch screen, trackball, joystick, touchpad, hand/foot control, voice recognition.	Allows selection and positioning of objects or data on the device. Mobile devices are often criticized for inadequate input mechanisms.
Output Capabilities	Monitors, speakers or any other visual, auditory, tactile output mechanisms.	Allows the human body to sense changes in the device; and to interact with it. Mobile devices are often criticised for limitations in output mechanisms such as small screen size.
File Storage and Retrieval	Storage capacity of the device (RAM or ROM) or detachable, portable mechanisms such as USB drives, CDs, DVDs, and SD cards.	Consistency and standardisation of storage and retrieval systems greatly affect usability.
Processor Speed	Response rates; speed with which the device reacts to human input.	Determined by the amount of RAM, file storage speed, user-interface speed, and system configuration. Unusually long or short response rates may affect error rates as the user may forget initial goals and/or task sequences.
Error Rates	Malfunctions resulting from flaws in hardware, software, and/or interface design.	Users may not be able to perform desired tasks and may lose confidence in the device.

The implication of this study, is that with many varied educational needs and the existence of mobile technology, a question arise: what is the influence of mobility in terms of education technology? That said, it is clear that education technology is linked to other education management issues such as administration and educational technology.

In the context of mobile learning, Ramli, Ismail and Idrus (2010:30) indicate that the learning process is slowly making its way outside of classrooms. The advancement of technology has led to emerging trends in learning and education, both in real life and virtually. This has resulted in the birth of a new term in learning and education – *mobile learning*. In Ramli, Ismail and Idrus (2010) study of this trend, it has emerged that mobile learning may well positioned to champion these innovations.

5.1.2 Mobility of technology: Use and usability

To explore how mobile technologies are being used in Higher Education institutions and the usability aspects of the mobility of technology, this section discusses issues such as:

1. Mobile technology used for various purposes:
 - Just-in-time learning and training
 - Photography
 - Data portability
2. Mobile technology is ubiquitous
 - Portability
 - Learning can happen inside or outside the classroom with an integration with mobile technology
 - Learners' satisfaction
3. Mobile technology and learning on physical environment for the learners
 - Technology available (the administration can loan devices to students, or students share devices)
 - Sustainability, affordability, access
 - Flexible technology and flexible learning
 - Context differs between rural and urban; and developing or developed countries.

Mobile learning/technology has changed the face of learning with technology in that learning can take place in many locations at any time. Koole (2009)'s research results on the mobile device intersection with usability and interaction in learning are adapted in the following table:

Table 5.16: The mobile device–usability intersection

(Adopted from Koole, 2009:33)

Criteria	Examples & Concepts	Comments	Implication for this study
Portability	Portability and durability (dependent on physical characteristics, number of components, and materials used to construct the device).	Affects the user's ability to move the device to different environments and climates.	These aspects may help the nomadic learner to mobilise the technology in many locations.
Information Availability	Anytime, anywhere access to information stored on a device. (This is distinct from information transfer, a characteristic of social technology)	Enables just-in-time learning; information accompanies the user; the user can retrieve stored information when and where it is needed.	These aspects perhaps help learners to transfer and share their learning material using a variety of mobile technologies.
Psychological Comfort	Learnability, comprehensibility, transparency, intuitiveness, memorability, and metaphors.	Affects cognitive load and the speed with which users can perform tasks. Metaphors, chunking information, mnemonics, simplification of displays, and reduction of required actions may reduce cognitive load.	Learning activities in mobile learning technologies may reduce the cognitive load.
Satisfaction	Aesthetics of the interface, physical appearance of the device, functionality, preferred cognitive style.	Because satisfaction and enjoyment are highly personal and culturally determined, user satisfaction is very difficult to predict.	Mobile learning motivation is correlated with 'user or learner ownership of devices which offer high levels of satisfaction.

The research contribution is highlighted in the fourth column of the table above. The literature shows that although people use mobile devices for learning, these devices were not initially designed for instructional and learning purposes. Kukulska-Hulme (2007) indicates that the devices used for mobile today were not designed for educational purposes. Because they were not designed to manage different educational activities, their application in educational context has sometimes been problematic. They are made to perform several functions and this means learning

activities have to compete with other activities like games, video and sound recordings.

The multiple functions and their usability of mobile device are articulated in the following quotation from one respondent:

Learners use the basic cell phones, because everyone has cell phones with cameras and video recorders. They use the cell phone primarily because the university provides them with PDAs. They use these PDAs, but they must give them back to the university. So, they have to use them for learning. Moreover, a few students do use iPods. They do not use them frequently because the university does not promote that and/or do not allow students to use iPods. Mobile devices such as cell phones are too interesting at this stage of use, including cameras, PDAs and pen and paper, which are also mobile learning tools (Respondent 1).

For this respondent, the university uses cell phones for the simple reason that the majority of students have access to and can operate cellular phones, even if some of them may have access to iPods and iPhones. Also the university has about 40 PDAs which lecturers loan to students, to take to class and experiment with. On observation, students were hesitant even though they appeared to enjoy using the PDAs. Nevertheless, they would have used the PDA as much as they used cell phones, if they had access to one the whole time.

Moreover, this particular university uses many mobile devices besides cell phones for students to access learning materials electronically, for example, digital cameras, PDAs, iPods and iPhones, depending on availability and access to these technologies. Although a lecturer still stands in the classroom and explains certain concepts, his/her explanations or demonstrations might be supplemented by e-learning using electronic devices. Thus, classroom discussions may not be considered to be an old-fashioned way of teaching students. Further usage issues are indicated in the following quotation:

The use of mobile technology depends on the context of the learner. For example in third world countries such as those in Africa, the most popular or the most useable mobile technology is the cell phone, basic cell phone. In these contexts, there are very few cases of successful use of cell phones to enhance learning especially since most learners are situated in very rural

areas with no fixed lines and a very limited Internet bandwidth. By contrast, a cellular phone is a mainly useful device in places like Norway or Finland given the quality of their technology. In this context, usability is totally different from usability in rural communities in Africa, where a student may have to travel sixty kilometres for Internet access or where there is constant interference with the network (Respondent 2).

Basic cell phones are the most desirable and popular form of technology in South Africa, although their availability may need to be investigated as learning tools. Mobile technologies can also include devices like data loggers, in some university contexts, that can be used remotely or in asynchronous situations. But electronic learning presupposes computers in a lab space, confined to a space where learners can engage with content. The computer guides or sets the learning path, as opposed to classroom learning or other face-to-face interactions.

The analysis of respondent 2's quotation reveals that mobile learning can address some learning challenges. An evaluation of how the almost ubiquitous ownership of mobile phones by learners could be optimised to enhance teaching and learning. The perception was that since most learners have their own mobile phones, this would most likely to contribute to the sustainability of such a project of mobile learning in Higher Education and issues of poor access and cost would not be such huge deterrents to learner participation. Sustainability, affordability, and access were considered by researchers to be critical aspects for the success of any technology intervention.

For Williams (2003:2), the most significant rationales for the development of technology as a discrete learning area were related to the technological nature of society and equity of opportunity for students. Notwithstanding the fact that mobile learning as a part of e-learning and both of them are integral to the use of technology in education, the act of learning with mobile technology stayed the same at any level of intervention.

The main difference between the traditional classroom, e-learning and mobile learning is basically the mode of delivery. I concur with respondent 2, because essentially mobile learning is classroom learning that takes place outside the physical classroom and mobile phones could also be integrated into learning opportunities inside the classroom. However, according to respondent 2 mobile learning might be integrated in such a way that the participants do not realise any difference between learning through mobile devices or through classroom settings. The respondent 2

indicates that mobile learning is frequently used outside the classroom rather than in lecture halls, because put simply, mobile devices are small enough to carry outdoors. This is perhaps the main difference between mobile learning and other approaches of learning with technology.

In terms of practical work, such as field trips or in the classroom, learners often need to utilise technology such as laptops, tablets or any other mobile / handheld device. A university of technology provide its students with mobile phones and PDAs to work on during field trips where there is limited technological infrastructure. One respondent revealed that learning with mobile technologies does not change the underlying nature of learning itself:

The act of learning doesn't change with the uniform or setting whether it is e-learning or mobile learning. In essence, learning is the same; it is just the medium, which changes not the learning itself. One thing worth mentioning is that when creating a mobile learning environment, designers should aim to provide more and more flexible ... unrestricted space and time for the learner but the act of learning stays the same regardless of the medium of instruction (Respondent 2).

The above remark indicates that learning is likely to stay the same whether it is face-to-face, e-learning or mobile learning. But there are other issues that we need to consider for this to be effective. These include portability and accessibility. Koole (2009:33-34) indicates that, portability and access to information are critical concerns in mobile usability given that mobile learning is not affected by the passage of time or changes in fashion and not limited by physical space.

Therefore, mobile learning cannot be achieved if the entire process is constrained by the size and weight of the devices. Devices potential therefore by handy and should be resistant to atmospheric conditions such as humidity, dust and shock because these conditions can affect the functioning of the device (Williams, 2003; Koole, 2009).

Implications for mobile teaching and learning are that learners can access, share and transfer stored information anytime or anywhere, making just-in-time learning possible. Moreover, many people in the work place need just-in-time training (Ally, 2005), which is now possible for many organisations institutions.

5.1.3 Mobility of technology: Management

The management of the mobility of technology in the Higher Education context presents various challenges and possibilities, which are discussed around the following issues:

1. Technology developments
 - Mobile technologies will never be mature enough
 - Growth of mobile technology manufacturing
 - Coping with these developments
2. Learning process
 - Providing learning challenges with certain outcomes to be achieved
 - Mobile technology to learn with, to help and to support learning
 - Integration of learning activities
3. Challenges
 - Lack of control
 - Lack of security
 - Cost and use

Mobile learning/technology can be managed if institutions have certain (specific) technologies as PDAs that they can lend to students. Nonetheless, this approach has implications for learners (learning experience), teachers (practices), technology planning and sustainability.

Within this context, the increasing presence of mobile devices prompts consideration of “their application and benefit in the curriculum and whether this is a marginal activity or ‘core business.’ The changing landscape is discussed in terms of changes relating to learners, institutions and the technologies” (Cobcroft, Towers, Smith & Bruns, 2006:22). A marginal activity or ‘core business’ are evident in the following responses from participants in this study:

Managing mobile learning is the same as managing any learning process – by providing certain challenges to the learner with certain outcomes that must be achieved. This requires guidance and facilitation but giving the learner the space to drive the learning process. This will enable the learner to achieve the desired outcomes (Respondent 2).

I don't think we will ever arrive at a stage where mobile technologies are fully mature. I think we will experience improvement and growth and development in mobile technologies, now we are not close to this ideal. This ideal is the same for any kind of technologies. I think of computers; the development of computers is so quick and so fast. These days, six months down the line after someone buys a computer, it is out of date already; there is new technology available. This ideal stage will continue to develop. What is concerning from the learning and teaching point of view is that many practitioners of learning and the learning environment just around technology instead of adapting the technology to serve the learning environment: that is more concerning than finding the most mature technology at this stage (Respondent 3).

It is clear that mobile technologies are growing rapidly, while learning institutions strive to implement popular devices and technologies in the field of education. Although a university may provide its students with mobile technologies, these devices lack certain management aspects in terms of teaching and learning. This conclusion emerges from one of the interviewees who stated:

First thing I must tell you; we do not work exclusively with mobile technologies. Mobile technologies are integrated as part of whole learning activities. Mobile technology and all other technologies aim to learn with, to help, to support and to teach the students in context, what they have to learn (Respondent 1).

At this respondent's university, students use laptops, PDAs, PCs, cell phones, pen and paper, whatever is necessary for learning. The institution has adopted a totally integrated approach when using these devices. Students at the undergraduate level, such as diploma students, can use their device during class sessions, or for half a day, or whatever they require, and then they return it to the institution. Thereafter, students discuss what they have done with the devices. Students at the post-grades can take the device with them, to use whenever they need it, depending on the task that must be done. For example, if they have to do an assignment over a certain period such as a week, they can borrow the device from the university; they sign it out, use the device, and then return it after the agreed time period.

In support of this argument, Respondent 3 mentioned that when students use the technology, it is very difficult to control either the technology or the students. The university gave the students a PDA with a SIM card, airtime for SMSs and data bundles but students only used these offers when it was necessary for them to learn

– they didn't merely use the facilities for 'playing', A lecturers could at least observe what the students did. It was clear that they used the technology to search the Internet, but that made it very difficult to manage. Another reason of lack of control is that people have different technologies available; depending on their cell phone contract, and on their personal use, all these things influence their accessibility to the use facilities. It was found that it is very difficult to manage their learning through the use of mobile technologies. With the newest cell phones nowadays it is probably going to be a lot easier, because even cheap cell phones can surf the web, download materials, and do many things that were previously not possible with cell phones that students had a year or even a month ago.

The above statements illustrate that mobile technologies are growing rapidly and universities will experience continual improvements, growth and development in mobile technologies. "It is the same with any kind of technology; as an example, the development in technologies is so quick and so fast. That these days, in six month down the line after one buys a computer it is out of date already [sic]. There is new technology available" (Respondent 3). Nonetheless, universities and other Higher Education institutions will continue striving to bring more technological developments into teaching and learning. It is a continuous process. Designers of mobile learning projects need to keep pace with the development of the technologies. One respondent claimed:

I am currently in the stage of development and not yet in the implementation phase, though I should imagine the environment of mobile learning that would determine the growth, acceptance and engagement with the management of technology setting – the boundaries for this to take place (Respondent 4).

Accordingly, a learner has the opportunity to engage with the content by means of mobile technology, and possibilities exist to collaborate with peers or educators on the topic in question. "The system should allow the opportunity for some integration of mobile learning. However, further issues are relevant to mobile learning in that it should be active learning, operationalised by cognitive, meta-cognitive and affective characteristics. In terms of resource, management of all learning strategies, it is necessary for students to effectively cope with the high level of demands, placed on the learner in a constructivist learning environment" (Anthony, 1996:349).

During the interviews, many respondents were particularly confident about the way they use the PDA. They trust these devices to manage their daily activities because

of the limitless Internet access and because they can carry them in their pockets. This means they can work anywhere and anytime. One of the objectives of universities of technology such as Cape Peninsula University of Technology is to invest in these portable mobile learning devices. Furthermore, Wishart (2009:274) has been found that sharing innovative practice was more successful amongst keen PDA users. Regarding the challenges confronting the management of mobile technology, the finding is that many practitioners of learning and the learning environment bind their practice around the technology, instead of adapting the technology to serve the learning environment. Engaging students in activities such as discussions, question answering, and solving problem does not automatically guarantee successful knowledge construction. Significantly, "the nature of students' metacognitive knowledge and the quality of their learning strategies are seen to be critical factors in successfully achieving learning outcomes" (Anthony, 1996:349). This is reinforced by the following testimony from two interviewees:

The university can manage mobile technology easier, because not all the learners have access to laptops and computers. But there are more than 2 to 3, or 4,000 PCs computers, on campus, in computer labs. But we have 45,000 students; that makes it difficult for them to have access and very few of them have computers at home. Many of our students come from very rural areas and there they can definitely use their mobile devices (Respondent 1).

I think mobile devices are better for rural areas. Absolutely, yes, especially when there is not always a supply of electricity in our country at their home, so they can access that (Respondent 3).

It has matured a lot – there is a lot more different devices; you know most devices can play MP3 audio files; most cell phones so, which was not the case a few years ago. So it becomes much easier I think, these days (Respondent 3).

Many traditional university facilities and technologies are still bound up in the university campus. However mobile technologies provide student services in and outside the university, particularly in rural areas. Mobile technology aims to provide and sustain affordable, portable (mobile / handheld) devices, applicable software and necessary infrastructure to both lecturers and learners to support and enhance teaching and learning activities at a university or school.

5.1.4 Mobility of technology: Pedagogical approaches

The pedagogical approaches of the mobility of technology are similar to those of any other technologies, such as the computer, in the context of technology-enhanced learning. However, the pedagogy of mobile technologies takes the notion of learning 'anytime and everywhere' to a new level, in that it does not depend on the location of the learner. The pedagogical approaches of mobile learning will be discussed as following:

1. Similarities
 - Technology-enhanced learning
2. Differences
 - More learning time and locations
 - More flexible learning environments
 - More attractive learning environments
 - More sustainable learning environments
 - Allows the upload and download of materials anytime and everywhere
 - Problem searching and problem sharing
3. Challenges
 - Suitable technologies and right tools
 - Learning tasks and learners' job in the learning environment

The literature on pedagogical approaches categorises key pedagogical issues according to three areas: information overload, knowledge navigation, and collaborative learning (Ally, 2009:4). But, in terms of mobile learning, the pedagogical approach is still unclear, as described by the following respondent:

The pedagogical approach in mobile learning is all it does is open up more opportunities to enhance learning and more opportunities to create a more attractive environment for the students that they can use. I don't use mobile technology or any kind of technology to try and achieve better pass grades or to get better results out of the learning process, but to create more flexible and more suitable circumstances and environments for the students to learn in. It is the same principle of using technology-enhanced learning. By finding out what the challenges are for the students in terms of finding resources and using resources available. Then find the suitable technology that fulfills that

specific need within the learning process and the learning environment. The goal for mobile learning technologies would be to find the right tool for the right job in the learning environment (Respondent 2).

The pedagogical approach described above focuses on finding suitable learning tasks, suitable technologies and suitable learning environments. However, this could create challenges such as finding resources for students to learn. The ensuing response provides an alternative pedagogical approach that would reduce the information overload, and enhance knowledge navigation:

I like to be different. I get bored quite easily, so its too boring for me to stand in front of the class day after day, year after year, and just use chalk-and-talk. However, mobile learning, to me, it is a challenge, as well as to the learner. I have to integrate the learning material with that in a sensible way; that the student or learner makes sense of what I'm trying to do. And it must be fun for them, because it is learning while playing, sort of. If one can use a mobile device, like the mobile device we use to enhance the learning process, motivate the learner to make it more interesting, that is what I will do and to help myself do something interesting; something to keep the attention of the student that is what I understand with mobile devices or mobile technology and mobile learning in the classroom (Respondent 1).

For respondent 3:

What is very important with mobile learning; people cannot use what they don't know about and I find that with any new technology. However, the university should introduce new technologies, such as mobile technologies, in the classrooms. And if a person doesn't know that something is available and they can use it, they are not going to use it. In that case, I think, I might have used things like 'podcasts'; it is very valuable, Internet links and getting extra information from the Internet. That will definitely influence the way that I'm teaching because I know what is available and I think a lack at universities for a lecturer is that they don't know what is available. They see these students walking around with an iPod and a lot of them have no idea what an iPod can do, if you have seen them. If students have been to the iTunes site, the free stuff, that anyone can download; it is unbelievable. And they can go on to 'YouTube'; the video clips that they can download from Stanford university website. It has got a whole bunch of video clips. These are lectures that

anybody in the world can use. It will definitely influence the way that we teach. However, I think more people need to know what's available and what's possible.

I am investigating two options: Manuals on the iPod/iPhone and Test-your-knowledge games. I hope that the concept of the Head-fake will allow the 'learning by doing' concept to be applied and that the learning process will be one of intuition and positive reinforcement throughout the process (Respondent 4).

These responses opine that mobile technologies open many new possibilities for people to learn. The learning tasks, problem searching and problem sharing, with linkages to daily life communication using social software, open up new horizons in learning and communication, especially when learners are encouraged to complete tasks using mobile technologies. The educator is able to review and consolidate work done in a classroom situation with mobile technologies. The link between the classroom and technology is, therefore promoted by staff and students. These 'pedagogically appropriate models' were identified and articulated for this study in some stages of mobile learning, but seemed not to have been communicated as being fundamental or adequate in terms of pedagogical approaches, when engaging with teachers about their roles. In order for university lecturers to adopt the 'pedagogically appropriate models' as identified by the university of technology steering committee processes, they would require substantial support and fairly major shifts in their current practice would be demanded of them.

5.1.5 Mobility of technology: Technical support

Emerging mobile technologies and mobile learning concepts assume that mobile learning takes place anytime and everywhere. Mobile learning can occur in open areas outside classrooms and lecture halls as informal learning. The University of Technology willingly uses mobile learning to support learners to share information and mobile devices. This section on supporting learning by mobile technologies is discussed according to the following issues:

1. Mobile technology supporting learning by context
 - Using Bluetooth to send and share lecturer's notes
 - Recording presentations and interviews
 - Recording videos
 - Distributing materials after the class

- Interacting, seeing, analysing and summarising
- Easy communication: one-to-one and one-to-many

2. Challenges

- Train lecturers and administrative staff
- Lectures' workload
- Academic developments
- Academic and social communication
- Resources and needs of lectures and students

In investigating how mobile technologies can support learning to imply support learning in Higher Education, the respondents raised several relevant points. For example, mobile technology can offer more opportunities in Higher Education, which is different from pedagogical approach. The following responses enforce this claim:

Technology does not teach people or does not teach people; people still learn the context by using the technology. I cannot see how do people learn with mobile technology; they use technology as a tool, it is definitely just a tool as is a pen or book. I just regard technology as a tool by which students are motivated to learn the context (Respondent 1).

I think what they do with mobile technologies is to support the learning. Students will find ways to use technology to help them or whatever. Like 'bluetoothing' lecture notes or what I have seen at university, is that once we were working with mobile devices, we were recording a presentation as interviewing skills for the final year students. However, quite a few of the students were sitting with their cell phones with a video function recording the interview. They can go and look at it later. A few of them were actually recording it. They are distributing it afterwards and watching it (Respondent 3).

These examples indicate how mobile technology can help and support learners in their learning tasks and projects. Technology offers new interventions in the form of learning tasks for fieldwork and outside the classroom. People find ways of learning with mobile technologies depending on where they are and on their immediate needs. Respondent 3 claimed that most new technologies are costly to implement and applications are costly to develop. It is expensive to train staff and facilitators. Furthermore, respondent 4 argues that mobile learning is still an expensive means of communications and the platform is restricted to simple solutions suitable for use on lower-end mobile phones. Respondent 1, a lecturer believes in outcomes based

education, whether it is effective or not. Students can achieve a lot with mobile devices using an approach integrated with other learning materials.

These responses reflect the fact that learners and lecturers can work independently or in groups, using mobile technologies. Students analyse different kinds of content. Supporting learners assumes that technology makes them better learners. The lecturer can still stand in front of the class using the talk-and-chalk method as part of an integrated approach; however the learners do not have to merely listen, they can interact with learning materials, see, analyse, summarise, and so on, using a variety of different learning technologies.

Some respondents remarked that the lecturer uses mobile technology when lecturing, especially the features for calculating, as well as the instant messaging features to communicate information to students. These methods have been very rewarding at one of the large universities, in the faculty of distance education, given that its students are spread all over South Africa. For example “students were able to receive reminders related to important academic issues from lecturers via SMS” (Respondent 3). This was, however, a one-way communication process because the technology could not receive and process feedback from learners. It was simply a vehicle for dispensing information; it sends information out but with minimal thought given to the average number of learners expected to use the mobile technology. In this vein, mobile learning achievable complement other methods of teaching and learning (Ally, 2009). This complementary relationship will allow for reinforcement and proficiency in the acquisition of knowledge and will also boost the confidence of the learner (Alexander, 2004). As a result, the learner is likely to prepare for a lecture, which will impact positively on their academic development. Teaching likely therefore is adapted to incorporate mobile learning essentially as complementary learning tools.

One of the key drivers of this support is to inculcate problem-solving skills, encourage investigation, and ensure that lecturers and learners are able to represent and discuss multiple solution strategies to the same learning problem. This means that attention may be refocused on how learners will be supported during the design and experimentation phases of this new approach in their learning processes (Respondent 1).

From the respondent 1, the universities seem to be focusing on reducing lecturers' workloads, not on shifting and supporting teaching practice. Even considering reductions in workload, assuming that this was in recognition of mobile technology

support – administration becomes a key part of the mobility of lectures' role. Reducing administrative workload potential free up time for pedagogical planning and collegial support, however it seems that from the findings the training of and support for lecturers is not yet one of the central aims of using mobile learning in universities. The support to learners appears to be largely between the individual and social work or communities of practice (Wenger, 2006). Any opportunity to bring lecturers, administrators, researchers and students together to share good practices and experiences, or to encourage general communication between them, involves visibility in social and academic communication within the university. Traxler (2009) contends, "mobile technologies also alter the nature of work – the driving force behind education and training – especially of knowledge work. Mobile technologies alter the balance between training and performance support, especially for many knowledge workers (14).

Traxler's articulations suggest that mobile learning is a new media literacy that we need to analyse the overall teaching, learning and instructional strategy in order to identify the kinds of resources, the learners' needs, and the activities required to support learners as they access the resources. Mobile learning potentially emphasise the need for supplementary learner support activities, which allow learners to maximise the use of the informational resources provided.

5.1.6 Mobility of technology: Learner motivation

Mobile ownership of learner motivation is another crucial element of learning with mobile technology. However, there are differences compared to the motivation of learners with respect to e-learning in general. This study indicates that motivation is an essential component of successful learning – it does not matter how effective the "online materials are, if learners are not motivated, they will not learn. The issue is whether to use intrinsic motivation (driven from within the learner) or extrinsic motivation (instructor- and performance-driven). Designers of online learning materials should use intrinsic motivation strategies to motivate learners" (Ally, 2008:28). Motivating learners in the context of mobile learning technologies is discussed according to the following aspects:

1. Intrinsic motivation

- Creating mobile technology-pull environments
- Students are already using mobile technologies
- Learners effectively decide which mobile technology to use

- Learners enjoy using mobile technology
 - Learners do self-instructional design by learners
2. Extrinsic motivation
- Challenge learners to use mobile technology
 - Design content to facilitate learners using mobile technology

To reflect how learner motivation adds another strand to mobile learning, the above-mentioned issues are discussed below in terms of reinforcement by the respondents, which emerges from their own view of mobile learning/technology, as follows:

Mobile learning motivates learners in the same way as facilitating learning, by not telling the student to use the technology, and not putting any distractions there for the learners. Rather create an environment in which they themselves argue: What if I used my cell phone? It can help me in this and this way and if using a PDA or I use this or this mobile device, it can mean and give me these benefits. So, rather creating opportunity as a pull for the students rather than giving a push and saying you will use these and these technologies (Respondent 2).

Actually, I don't have to motivate them, because they want to do it and its cool – they tell me that they really want to do it. They enjoy it. They sort of show off at this stage because there are only a few that are working with these things on campus. Everyone else wants to know what is that and what do you do with that? So, I make things interesting to them I ask them to take pictures and bring it back. I give them sort of open season with it. I give them an assignment and they have to be creative in giving me feedback about that. It's a challenge to them because it's something new so as a young person they want to explore; they really don't need a lot of motivation from my side to use the thing. Let's take an example of a podcast; if you put a podcast up and the students can see the value of going and downloading that podcast they will download it. If I feel that the student can see the value of whichever technology you are integrating they will use it (Respondent 3).

Students are already using these technologies to facilitate the understanding of their environment; if we design the content with this in mind the student will see it as facilitating further understanding - we should possibly also see mobile learning as an optional additional learning environment. That the student can use if they want to with occasional compulsory interaction

required facilitating interaction - as one would with the library resources in any institution (Respondent 4).

Motivation in mobile learning consists of incentives and positive rewards for completing tasks (Respondent 5).

Accordingly, mobile learning environments work as a 'technology pull' factor to motivate learners to do their learning tasks. Although mobile technology does 'push' learning, learners use mobile technology spontaneously, individually and collaboratively. They use mobile technology to create their own learning environments and learning tasks. The argument is framed around the premise that learning is located within a context and learning activities apparent therefore be based on real life experiences emerging out of that context. This can be achieved through case studies and simulated role-plays.

Learners should also be given "the opportunity to complete assignments and projects that use real-life applications and information. Transfer to real-life situations could assist the learners to develop personal meaning and contextualise the information" (Ally, 2008:29).

5.1.7 Mobility of technology: Staying online

One of the reasons students stay online and continue learning is the technology itself. This sub-section investigates aspects of the learning experience that keep learners online and studying in mobile leaning environments. The following issues are discussed:

1. Instructional designer design assignments and activities that allow learners to use mobile technologies.
2. Mobile technologies enable university students to be online anytime and everywhere.
3. Universities may plan, design and create mobile learning opportunities.
4. Mobile technology creates layers of collaborative and social interaction for solving problems.

A study by Cronjé, Adendorff, Meyer and van Ryneveld (2006:188) found that one of the reasons for students staying online and learning is that "activity-oriented students enjoyed getting to grips with new technology. They reported enjoying activities such

as participating in an online demonstration of software building, online puzzles or participating in a virtual photo shoot” (188).

The creativity of the metaphor of mobile technology intrigued the learning-orientated participants who enjoyed the mobile learning experience. Similar issues are reflected in the response from one interviewee:

It is very important when you plan the mobile learning environment that you make sure that the assignment you give, the learning activities you provide; make it possible for them to use the mobile technologies. To reach their goals you create opportunities where they can use whatever learning technologies suit their needs. The best, for instance, for handing in assignments – some students will hand it in by email whether they use it from a PC or cell phone. They use the email, but you provide learning activities and learning tasks where they are not, I mean the specific location base is not restricted – it is not restricted to a specific location – you ask them go and to make an assessment. For instance, a science laboratory is some distance from where they are in class. And they have to take photos and they have to do certain tasks that they can only do if they have mobile devices available to do it on. Sometimes they share those technologies with their friends, sometimes they use their own. Institutions should create the opportunity to use the mobile technology – it is planned in that way and it is designed to create mobile learning opportunities (Respondent 2).

Staying online and learning are crucial elements of learning with mobile technologies, and are influenced by the activities, the type of new technology that students are using as well as the design-based tasks that are set for students. In the statement below, the respondent supports this statement:

For the students, it is easier, because with mobile technologies, they can be online whenever and wherever they are. It will fit in with their social life they are used to. One mustn't forget that we are getting a new breed of student that are used to the Internet. They are used to accessing things and instant things. The major role in a university is the driver actually from the student's side, to get things available (Respondent 3).

What makes students stay and learn with mobile technologies is that they find something new, something that they haven't done before. Technology is

changing so fast that they need to keep up with developments. It is always a challenge to students; "they keep asking themselves: 'What can I do more and what can I do better?' There is also some competition among them: one takes a photograph with a cell phone and the next one will see that; they will take a video recording with the cell phone and the next one will add on top of that. It is always a challenge to get something else and how to use this technology in what they have been asked to do" (Respondent 3).

From respondent 3, it is clear that learners are seeking new ways of learning and found a good learning opportunities to learn, search creating competition using mobile devices.

To clarify this system of the social message of mobile technology, studies by Blignaut and Trollip (2003); Cronjé et al. (2006) generated taxonomies of facilitator messages, which distinguish "between those with academic and non-academic content. Academic content relates to intellectual messages with sub-headings dealing with corrective, informative and Socratic messages" (Cronje et al 2006:189). Therefore, the mobile learning signs of development, as part of e-learning, has a technological impact on past, present and future learning.

Collaborative learning projects that require assistance in completion exercises that prepare the student for solving interactive problems. Or possibly the use of high scores published for the class to compare and compete against (Respondent 3).

Adding another layer of collaboration of mobile learning that would create discussion forums and messages (SMSs, MMSs) can be used to add the personal touch while engaging with content (Respondent 4).

Collaboration may occupy university boards and ethics committees in accepting this form of technology into their environment to allow student stay online and learn. On the one hand, examples were cited from schools in terms of SMS-based bullying by teenagers, and in Higher Education there has been online personal criticism of lecturers via Facebook. On the other hand, some respondents felt it is just a new but inevitable risk that must be weighed against the benefits of the technology (Bird & Stubbs, 2008:40).

5.1.8 Mobility of technology: The disaffected learner

Disaffected learners are those who might drop out of the school system, or do not cope with institutional programmes. Drummond (2008:129) claims that mobile technology may help these learners to come back and cope within the Higher Education system. To find out how mobile technologies could help disaffected students to cope with their learning in Higher Education, the findings are discussed in terms of issues such as:

1. Institutional policies play a key role.
2. Universities may use whatever means to ensure that flexible learning is effective.
3. The mobility of technology should be considered.

For example, in the context of South African universities learners suffer from lack of motivation. Learners enter universities with different anxieties, fears and expectations and they often disoriented by the culture of universities (Pineteh, 2010). And because they come to universities with varied technological experiences, mobile technologies used to engage disaffected learners in order to motivate them to learn. Although "policy was not within the disaffected students' remit it was not possible to consider practice without considering policy and the role of agencies and or individuals in this regard" (Jones, Issroff & Scanlon, 2007:20).

In this study one respondent was asked whether learners who drop out of the school system could be lured to return through the use of mobile technology. The respondent answered:

Yes and no, because universities have an open view of using technologies in the learning environment without being restricted to a specific mobile device or specific technology. There can be a mobile learning environment created; whether the students use a PDA; or whether they use a cell phone; or whether they use computers; it doesn't matter. Universities try not to restrict students to specific technology; rather have them use what is suitable for them in the environment. Use what makes it work as flexible learning, technology for them to be mobile and the mobility of the learners to be involved (Respondent 2).

This respondent tries to find out what it actually means to be a disaffected learner, and clarify why some learners become disaffected. There are some disaffected learners, especially those who have no idea about technology. Some of them come

from places where they haven't touched a computer in their lives before, which results in them being rather afraid of technology. But then they start learning with technology; and attend a training course or two to become familiar with the tools. Eventually they become keen on using technology tools. Even those who get bored, and start playing games are still using the device. Therefore, there are very few learners who are really negative about using mobile devices.

Other respondents expressed the following opinions:

Definitely, there are different types of learners. And there are different types of people who don't like to learn using mobile technologies. They will, if one gives them a hand in getting online with mobile devices. Hence, they will download handouts and read it on their laptops, mobile devices and computers. There are those who will pay R15, so that they can have a hard copy; these are definitely people who don't feel uncomfortable with it (Respondent 3).

They stay engaged in thinking of design issues in mobile learning environments. It has been claimed that students are content driven. Does the content engage the user? Is the information provided useful? Are the content easily accessible and the UI intuitive? Does the design fit the aspirations of the user? (Respondent 4).

While clarifies how disaffected learners would engage in mobile learning, the availability of the resource encourages constant or regular participation. The educator should play a leading role. Assign tasks to be completed within a certain timeframe (Respondent 5).

From the remark quotations from respondents 3, 4 and 5, is that mobile learning environment add layer of learning design by searching for opportunity for learners for more engagement in learning, designing and searching. Drummond (2008:129) conducted a similar study, which included disaffected learners. The project engaged students who are disaffected learners at risk of leaving the education sector. Many of these students see little reason to spend time in a classroom; they demand relevant educational activities that can be applied in work situations. These students respond positively to opportunities to learn in real life situations and will engage with mobile learning that according to Drummond (2008:129):

- *Supports close communication with the teacher and other members of the class using the short message service (SMS) and multimedia message service (MMS);*
- *Provides access to educational content that can be reviewed on demand, customised or manipulated to meet individual learning needs;*
- *Enables students to create educational content;*
- *Enables students to record a problem and seek assistance;*
- *Enables students to document their learning outcomes.*

Mobile learning is likely to connect learners and nurture a culture of intellectual exchange between learners and teachers. It should also recognise and facilitate learners' contributions to the process of teaching and learning. Finally, it may well create a community of practice, whereby learner collaboratively interfaced and use online experiences to enhance their own learning.

5.1.9 Mobility of technology: Instructional design

The core elements of instructional design are analysis, design, development, implementation and evaluation. Some lecturers at university design instructional activities for students using mobile learning. Others do not design any material specifically for mobile learning, instead allowing learners to design their own instructions by using mobile technologies. The findings on instructional design for the mobility of technology are discussed around the following issues:

1. Learners' design
 - Students design their own instructions
2. Challenges
 - The University of Technology WebCT Learning Management System (LMS) allows limited instructional design and depends on JAVA and cell phone capacity.

Instructional designers have taken mobile technological characteristics into account in designing educational activities based specifically on the use of mobile devices. Due to the diversity of applications and uses of m-learning, different types of these applications have been developed and presented in several reported works, including text based applications like quizzes or class notes (René & Gabriel, 2010:9).

In the design phase, the designing part should be the majority of the time that designers spend when they plan mobile learning or any technology enhanced the implementation and the development. The implementation should be the biggest section something like 70 to 80% of time in a project. Implementation should be dedicated to proper planning and designing that is the key if one wants a successful learning experience (Respondent 2).

I do buy software programs for multimedia where I can use it in my subject in Biology where I go out on the field. And the students need to know what does this bird, snake or tree look like? I use those kinds of already available materials for PDAs. It means that every student can use his/ her mobile phone to record in the field (Respondent 1).

From respondents 1 above quotations is that this implies that the lecturer uses available multimedia programs in mobile technology. However, this does not refer to 'design' as in programming, but they gather information and compile a document or more than one document, which they submit in whatever format they choose, such as Excel, PowerPoint or in Word. There is no limit for them in mobile learning. Students can do whatever they want to with the information they have. They take pictures with cell phones or cameras and put them together with what they gathered through the PDA, which they submit as one Word document, or some develop PowerPoint presentations.

In describing the design of the interface in terms of cosmetic adequacy of Hannafin and Peck (1988), the interviewees responded as follows:

Unfortunately, no design, because at this stage the university is using WebCT as a learning management system (LMS), it runs on JAVA at this stage. It could not be open to any cell phone, because it is too big; it doesn't have any interface between the learning management system and the mobile technology. I see that the new Blackboard has a plugin for mobile technologies, which can actually get fees and manage stuff on the learning management system, but the university didn't have it at this stage (Respondent 3).

The design principles of typography, layout and colour; as well as colour composition; colour and contrast are vital to accessibility and clarity. An Apple device determines the parameters on the iPod and iPhone; the limitations in

this regard also place certain levels of restriction on the interface design
(Respondent 4).

René and Gabriel (2010:10) states that there are several factors that the instructional designer maybe take into consideration in activity design, such as type of technology, physical space, use conditions, setup time, as well as training of participants in the use of the technology. These are just some factors that lead the design phase and should be considered when developing an activity in order to obtain successful results. They can be seen as functional requirements.

SECTION 2

IMPLICATIONS OF THE MOBILITY OF LEARNERS

5.2.1 Introduction

The mobility of learners refers to the claim that learners are becoming nomadic in the Higher Education landscape. Ally (2009:2) concurs when it postulates that “nomadic learner and worker travel frequently from place to place, and will similarly use mobile technology to access information and learning materials from everywhere and at anytime. A major benefit of using wireless mobile technology is to reach people who live in remote locations where there are no schools, teachers, libraries or electricity”.

This is particularly true in Africa, where the availability of wireless technologies, particularly mobile phones, in remote areas has helped to change the social existence of members of those communities. In rural Africa, for example, people are able to connect, exchange information and build business relationship without the luxury of electricity. This has improved the quality of life in communities. However, because these are rural areas, mobile phone reception may be hampered by the poor quality of satellite technology. With these wireless devices, they are sometimes disconnected from the rest of world for days. Interestingly, this fosters the notion of ‘nomadic learner’ heralded by Ally because poor quality reception forces people to move from one place to another searching for better reception.

This section discusses the results yielded, in terms of the following five issues:

1. Mobile learners' experiences
2. How do mobile learners learn?
3. Attitudes of mobile learners
4. Strategies of mobile learners
5. Empowering mobile learners

The mobility aspect of learners, according to Koole (2009:29-30) takes into account “an individual’s cognitive abilities, memory, prior knowledge, emotions, and possible motivations. This aspect describes how learners use what they already know and how they encode, store, and transfer information”.

Table 5.17: Learner aspect

(Adapted from Koole, 2009:30)

Criteria	Examples & Concepts	Comments	Implication for this study
Prior knowledge	Cognitive structures already in memory, anchoring ideas, schema theory, Gagne's conditions for learning.	Affects how easily a learner can comprehend new concepts. Potential problems include 'assimilation bias' (a reluctance to adopt new procedures).	Nomadic mobile learners would access their information at anytime to refresh their memory by gaining their attention.
Memory	Techniques for successful encoding with the use of contextual cues: categorisation, mnemonics, self-questioning, semantic & episodic memory, tactile, auditory, olfactory, visual imagery, kinaesthetic imagery, dual coding, and encoding specificity.	Inclusion of multimedia by providing a variety of stimuli may help learners understand and retain concepts more easily.	Learners would also implement an individual learning design using mobile devices.
Context and Transfer	Inert vs. active knowledge.	Actively using information aids for learners to remember, understand, and transfer concepts to varied contexts.	Context is mobile technology, which drives learning; the technology pull and transfer of concepts to varied contexts via mobile device.
Discovery Learning	Application of procedures and concepts to new situation; solutions for novel problems.	May stimulate learner to develop skills to "filter, choose, and recognize" relevant information in different situations.	Mobile learning enables seeking, searching and self-design of learning problems and learning tasks.
Emotions and Motivations	Feelings of the learner towards a task; reasons for accomplishing a task.	A learner's willingness or ability to adopt new information may be affected by his/her emotional state or desire to accomplish a task. Activity Theory may provide additional avenues of investigation into motivation.	Learners are self-motivated to accomplish and design learning tasks, driven by self-regulation, and taking full responsibility and freedom of learning.

The research implication of this study into the field of mobile learning is highlighted in the fourth column of the above table: Nomadic learners can use mobile technologies to access information anywhere and at any time in order to refresh their memory and recall prior knowledge. Mobile technologies help them to share, transfer and design their own learning experiences and materials. New mobile technologies can help learners to seek, search, design and solve learning tasks and problems – thus creating their own learning environments and opening new horizons for various learning spaces in and outside of institutional campuses.

One can also focus on the nature of mobility in order to explore the nature of mobile learning. For each learner, the nature of mobility has a variety of connotations and these will colour conceptualisations of mobile education. It may mean learning whilst travelling, driving, sitting, or walking; it may be hands-free learning or eyes-free learning (Traxler, 2009:15).

5.2.2 Mobile learners' experiences

A mobile learner can engage in learner-centric activities, which lend themselves to mobile and nomadic situations. To explore the learners' experience of mobility, the following issues are discussed:

1. Mobile learners' experiences are more resource-rich learning environments, more flexibility, more challenging.
2. Mobile technologies give nomadic learners responsibility by involving them in mobile learning activities.
3. Learning is a continuous and sustainable process.
4. We need to teach learners how to learn.

These issues were reinforced by comments from the respondents, such as:

The nomadic learners who use mobile wireless technologies – it may be a more resource-rich learning environment, may be more flexible, may be more challenging, but the experience isn't better or worse than other learning opportunities and other learning experiences (Respondent 2).

Nomadic learners are very positive about mobile learning. They save all the feedbacks that we give to them. It is to their advantage, because they don't only have to look and listen to the educator standing in front of the class. They are now involved in the learning materials, that is very important; they feel

positive about the involvement that they do. Mobile technologies give a little bit of the responsibility back to the learner by involving them in mobile learning. They have to go and find information, analyse that information, summarise and give them back for assessment. It is not only listen and look and fall asleep, because they are now actively involved that they experience it so positively (Respondent 1).

Significantly, from the respondents, in their learning, the students do not necessarily have a starting point and a finishing point; they progress along a continuous path, otherwise it is not sustainable. Some tasks are assigned for a week, for example, such as field trips. In the field they use mobile and wireless technology extensively, because it is visual and they need to investigate and identify certain phenomena and make notes.

Technologies are evolving, so new ways of engaging and using the technologies will evolve. At present applications are being developed by skilled and semi-skilled developers; with the recent trends in user-generated content this will probably change. Collaboration and peer reviews should be encouraged. The lecturer/facilitator is able to keep a personal involvement with the conversation between the students and him/herself that would otherwise be limited to private conversations. This feedback can be seen as playing a vital part in maintaining progress and relevance as well as avoiding the 'disaffected student' dropouts (Respondent 3).

Mobile learning is ideally placed to be continuous and not restricted to certain physical areas or certain subjects. Any attempt to restrict mobile learning opportunities to certain fields or certain periods in the year would negate the whole goal of mobile learning which is to provide an integrated and more flexible learning environment for the learner.

One finding does this interviewee describe that the students are having fun, as:

In mobile learning they learn while they are having fun – they learn and they enjoy working with that and that is very stimulating and very positive. The students ask when we are going to use this again. If I stop using it for a week or two then they start to ask when are we going to use the PDAs again. So the impression is that it's a positive experience to them that they want to use this, and in the process they learn by using this and not only the content of the

subject. But the responsibility on how to use this things, take care, keep it clean, bring it back in the same condition – therefore, there are other things around mobile learning besides that they learn and have fun (Respondent 1).

This point indicated the fact that articulated by Pham-Nguyen, Lau and Barby (2008: 240) as Nowadays, technology-enhanced learning systems must have the capability to reuse learning resources from large repositories, to take into account the context and to allow dynamic adaptation to different learners based on substantial advances in pedagogical theories and knowledge models. This is particularly true in mobile learning.

For Phan-Nguyen and colleagues, computer-enhanced learning systems can be sustainable, fluid and responsive to different learning situations. The learning process possible therefore to be heuristic, allowing learners to draw on different experiences and theoretical conceptions, using them to enhance their academic growth (Pineteh, 2010).

These dynamic adaptations of mobile learning technology are that:

To teach learners how to learn, this will enable them to function in the industry when faced with new developments in standards, software/hardware and trends (Respondent 4).

... would like to be exposed to content knowledge that would assist the learner to meet the learning outcomes of the task (Respondent 5).

The first step is to teach the learner how to learn with mobile technology and then to support them in meeting the learning outcomes. Although various mobile technologies, as a learning medium, “may be hindered by low bandwidth and limited input and output capabilities” (Koole, 2009:40-41), they have some distinct advantages, such as:

- *Wireless, networked mobile devices can enable learners to access relevant information when and where it is needed.*
- *Mobile learners can travel to unique locations, physically or virtually through their mobile devices.*
- *The ability to access a variety of materials from anywhere at anytime can provide multiple cues for comprehension and retention.*

- *Learning within specific contexts can provide authentic cultural and environmental cues for understanding the uses of information, which may enhance encoding and recall.*
- *Well-implemented mobile education can assist in the reduction of cognitive load for learners.*
- *While it is difficult to determine how to chunk information, differing patterns of presentation and amounts of information can potentially help learners to retain, retrieve, and transfer information when needed (Koole, 2009:40-41).*

5.2.3 How do mobile learners learn?

Alexander (2004:34) describes “nomadic learning along two dimensions: the physical versus the digital, and the sedentary versus the nomadic — the wireless, mobile, student-owned learning impulse cuts across our institutional sectors, silos, and expertise-propagation structures. How do we respond to such across-the-grain learning? Is this a budding venue for curricular transformation, wedding student interest to institutional practice?”

Nomadic learners using mobile learning are varied in their locations, age, as well as the level, availability and type of technologies to use for learning activities. To find suitable answers for how learners learn in various mobile learning environments, the following issues are discussed:

1. Learning depends on the students' level, age, mobile technologies available and learning tasks required.
2. Learners experience challenges in keeping up-to-date with new technologies and developments.
3. Lecturers need to create new pedagogical learning spaces based on many locations with connectivity and access to information.

In response to the question: how prepared are we in Higher Education to cope with, or take advantage of, these deeply rooted differences? Interviewees claimed that:

It depends on the level of the students and in which area they are. The student that has been using technology a lot in their learning would say mobile learning is just the way we do it, that is the way we expect it, we have to use the technologies that we have in our pockets to learn. They wouldn't see it as

strange or a new type of learning – they will just see it as media operations that always function. While if you have a class where, for instance, you have people between the age of 14 to 16 and a classroom that is not technology enabled, that kind of generation would see mobile learning as a very restricted learning bound to a certain type of technology. They say mobile learning is learning on my cell phone; it is completely different thought processes in the way the new generation sees cell phones, PDAs and laptops as normal day-to-day instruments (Respondent 2).

Expect from students when they use mobile technologies - responsibility because give them a tool of between seven to ten thousand Rands. Expect them to do the work, the assignment that is provided for them to do not playing around and fool around with the instrument or with the device (Respondent 1).

Educators obviously expect students to learn while using mobile devices. Mobile technology is merely a tool; that students may gain knowledge via these technologies.

... asking an average student how they learn with mobile learning technology will immediately result in a reply of “cell phones” (Respondent 3).

Respondent 3 indicates that cell phone is the first and usually the only mobile technology that they have. A few of them who have laptops might talk about the Internet or the campus learning management system. Most students, when asked what mobile learning is, actually know what it is, and they mean using their basic cell phones for learning or accessing the Internet. Further than that, learning with mobile technology perhaps be progressive learning, own language, and include interactive conversations. Up-to-the-minute relevance and user-specific choices are vital for further learning (Alexander, 2004). These issues are reinforced by the following response:

The excitement of using a modern device for the learning process as well as keeping up-to-date with the latest technologies - instant feedback (Respondent 5).

Therefore, three out five of the experts in this study see mobile learning as mobile technologies. Mobile technologies create new learning spaces for the Higher Education landscape, such as information commons, where wireless, mobile

“connectivity admits the full informatics range of the Internet into any niche or conversation. Older spaces take on new pedagogical meaning; for example, wireless cafes allow the full range of class work to be deployed between a coffee and a bagel” (Alexander 2004:31). Here, the notion of timeless and the concept of nomadic learner are again foregrounded. For him, the value of mobile learning is its ability to promote learning between learners in different geographical spaces and time zones (Alexander, 2000; Koole, 2009).

5.2.4 Attitudes of mobile learners

Mobile learning scenarios provide some learning opportunities for learners to learn anywhere and anytime. However, Divitini and Morken (2007:14) assert that it is “important for technologists to take a proactive attitude and promote a discussion among users around specific devices and the possibilities that they open”. For them, the devices use for mobile learning feasible to be the collaborative decision of the different stakeholders. By so doing they can easily identify and deal with challenges confronting technology in education in general and mobile learning in particular.

The findings on the attitudes of mobile learners are discussed below under the following issues:

1. Mobility of learners attitudes: they are always on the move – flexibility and mobility
2. Mobility of learners attitudes: they are using mobile technologies all over
3. Mobility of learners attitudes: they integrate mobile technologies spontaneously

Proposed learning solutions to learners’ attitude include, among others, the use of scenarios. Here, one interviewee describes an example of the use of scenarios in a private graduate institution:

I am going to use examples from my own institution. If they're on a short course where learners are working as employees and they are always on the move, their need would be around flexibility and mobility, so that they can make the best use of their time and the environment as they are on the move and on the go. While students that are full time residential university students will sit in a classroom; mobility is not a challenge for them – they are bound to a specific classroom. But they don't want to go to the PC lab to get access to the Internet resources; just where they sit they want access to the PowerPoint slideshow on their cell phone (Respondent 2).

Students want to log into the Internet via mobile devices, via a hotspot created in the classroom and get access to the resources as they go along during the lectures. This is not mobility in terms of space – it is mobility and flexibility in terms of access to resources available to the students. The other extreme is where the student needs to be mobile himself or herself and needs access to resources while they are on the move.

Mobile learning makes a clear link between the building of daily life, learning, social lifestyles, tools and attitudes. It reflects an increasing need for a different kind of educational experience that surrounds people and their relationship to their environment. Such a definition of mobile learning and the needs it meets includes social and individual learning environments, which have extended the use of mobile technology in every day life activities. An interviewee describes the use of another mobile learning scenario:

Learners use mobile technologies all over. They use it inside the classroom and they use it outside the classroom to give immediate feedback when they have been asking questions. They use it to develop assignments. They work outside where they have to do calculations or observations to spot animals in biology subjects. They use Excel spreadsheets to draw tables and so on. They use PowerPoint to identify things outside the classroom. For our postgraduate students, they were given mobile technologies for six months and when they are out there in the field they gather information on the PDA. And they put it in one document they can email that document wherever they are (Respondent 1).

Learners learn at any time what they need via mobile technologies. They can sit and get that information immediately 'just in time' and they can send it wherever it needs to be sent. They can see the value added through using a mobile device. Mobile learning opportunities need to be integrated by lecturers in the whole learning process. Most students already use mobile devices in their daily activities, so the integration of mobile technology in learning enlivenment is spontaneous. For most students, mobile devices are part of their social and learning lifestyles gadgets. The next respondent supports these arguments:

Learning starts at home and ends only when the learner dies (physically or intellectually) (Respondent 5).

The attributes of complexity in the use of mobile technologies, observed in the form of exchange of information, media and data, offer a relative advantage depending on the compatibility of the technology rather than the attitude of the learners. Therefore, if mobile technologies are sufficiently flexible to be adopted, they bring positive attitudes in the experience of the learners and enhance the continuing use of quality learning opportunities to expand learning spaces on and off university campuses.

5.2.5 Strategies of mobile learners

“From an educational perspective, students need to be aware of the reasons for carrying out specific learning activities. Mobile as a personal technology could provide context-specific guidance, for those occasions where the teacher is not available” (Anastopoulou et al. 2008:17). In seeking suitable answers as to what learning strategies mobile learners plan in mobile learning spaces; the findings are discussed around the following issues:

1. Finding resources
2. Providing unlimited learning tasks
3. Solving learning problems
4. Submitting learning tasks electronically via mobile technologies
5. Conducting progressive, interactive conversations, with up-to-the-minute relevance
6. Making user-specific choices for further learning

When asked to describe the learners' learning strategies, an interviewee argues from the constructivism point of view as follows:

That is difficult to answer – we cannot look into the students' heads and see their strategies, but learners should be finding resources to be able to solve learning problems and learning outcomes given to them. This is one of the key strategies, in other words, finding resources to fulfil their learning tasks. The other one is to complete learning tasks, for instance, typing and submitting assignments online via the mobile device instead of writing it on a piece of paper and handing that in as an assignment. The two main strategies would be finding new resources and providing learning tasks and submitting learning tasks (Respondent 2).

The suggestions that emerged from the findings are that information sharing is an important issue for mobile learning, as well as information capturing such as taking

The attributes of complexity in the use of mobile technologies, observed in the form of exchange of information, media and data, offer a relative advantage depending on the compatibility of the technology rather than the attitude of the learners. Therefore, if mobile technologies are sufficiently flexible to be adopted, they bring positive attitudes in the experience of the learners and enhance the continuing use of quality learning opportunities to expand learning spaces on and off university campuses.

5.2.5 Strategies of mobile learners

“From an educational perspective, students need to be aware of the reasons for carrying out specific learning activities. Mobile as a personal technology could provide context-specific guidance, for those occasions where the teacher is not available” (Anastopoulou et al. 2008:17). In seeking suitable answers as to what learning strategies mobile learners plan in mobile learning spaces; the findings are discussed around the following issues:

1. Finding resources
2. Providing unlimited learning tasks
3. Solving learning problems
4. Submitting learning tasks electronically via mobile technologies
5. Conducting progressive, interactive conversations, with up-to-the-minute relevance
6. Making user-specific choices for further learning

When asked to describe the learners' learning strategies, an interviewee argues from the constructivism point of view as follows:

That is difficult to answer – we cannot look into the students' heads and see their strategies, but learners should be finding resources to be able to solve learning problems and learning outcomes given to them. This is one of the key strategies, in other words, finding resources to fulfil their learning tasks. The other one is to complete learning tasks, for instance, typing and submitting assignments online via the mobile device instead of writing it on a piece of paper and handing that in as an assignment. The two main strategies would be finding new resources and providing learning tasks and submitting learning tasks (Respondent 2).

The suggestions that emerged from the findings are that information sharing is an important issue for mobile learning, as well as information capturing such as taking

photos and video clips. Sharing information afterwards is also an important strategy. If there is a need, students will use whatever technology is available to fulfil that need. They would do a search using their mobile phone to find one. And they will use the technologies whenever the need arises. Responses from interviewees reinforce these strategies:

Some strategies are progressive, own language, interactive conversations: Up-to-the-minute relevance, user-specific choices in further learning. The lecturer should be well prepared, resourceful, and encourage individual learning (Respondent 4).

Learning strategies for mobile learning are funky, great, opportunity to multi-task while doing work (Respondent 5).

According to the respondents 4 and 5, learning is multi-tasked because of the convergence of wireless technologies. In their responses, they also addressed the challenges of mobile learning, including instructional strategies, learning content, and design to promote continuous modern-day learning activities. Learners may experience mobile learning in order to benefit from the learning process through that medium. The purpose of the learning experience is "for the learners to gain skills and knowledge through the learning process and / or for there to be a change in attitudes and beliefs" (Ramli, Ismail & Idrus, 2010:30).

5.2.6 Empowering mobile learners

A study by Divitini and Morken (2007:13) uncovered that students using mobile technologies coordinate their work, especially in the context of group-based projects. The use of mobile tools is often advocated as a democratic answer to Learning Management Systems (LMSs), which are generally based on a closed and centralised model of knowledge. On the contrary, mobile tools generally support bottom-up knowledge creation and easily adapt to different learning practices and needs. In addition, they are easy to install, configure, and use. This implies that their adoption does not require commitment at the organisational level. In this way, lightweight tools empower students and teachers, allowing them to find better support for their specific needs. "We strongly believe that tools empowering learners are essential to promote creativity and innovation" (Divitini & Morken, 2007:13).

To find out how the mobility of learners empowers learners in the learning process, the following issues are discussed:

1. Making it possible for the learner to learn on move
2. Mobile technology is an informal vehicle for complementing learning.
3. Mobile technology empowers learners by self-directed learning designs.
4. Access to learning is improved in the form of user-driven access.
5. Collaboration and cooperation in terms of interaction between learners and learner groups creates communities of learning and communities of practice.
6. Mobile technologies help students to get real-time information and real-time support.

How mobile technologies empower learners is reinforced in some of the responses from interviewees:

Empower learners by making it possible for the learner to easily and in more ways and more creatively solve their learning problems and their learning tasks (Respondent 2).

In the first place, some of the learners have never touched a computer. When one tells them that we are going to work with computers in the class, they immediately get scared. However, when one teaches them how to work with a computer and within the training session within 10 minutes, they can create a PowerPoint presentation. And they know what to do with an Excel spreadsheet. Someone has to empower them to work with technology. When they get to this technology it is very much the same when they work on the small one, and then tell them to go to the PC and develop a PowerPoint and they can do that. So the first place is to empower them to work with technology and empowerment within themselves to get confidence and self-confidence. That is to me one of the major advantages of working with these things, is that the students get responsible and get self-confidence because they can work with their own little device. When we work with that it's anonymous so they put on the screen whatever they feel. We discuss that and many times students have self confidence because they said exactly the same thing as a bright guy in class and they start developing that confidence to participate in other things, so that is a huge advantage for me (Respondent 2).

The findings show that mobile technology puts the learning in the hands of the one who wants to learn. Mobile technology gives the learner the power to access things. The learner doesn't have to wait for the lecturer or for the university – if they find

something interesting, they can access it; they can actually find information for themselves, solve problems and search for more problems while they are learning.

These findings are further reinforced by the following interviewee comments:

Mobile technology is inherently an informal vehicle used for complementing the learning process whether integrated into the programme or not (Respondent 4).

Technologies empower learners by repetition – it allows learners to repeat in order to succeed (Respondent 5).

The findings from respondents 4 and 5 are that mobile technologies informally empower people to learn with available technologies in their hand by repetition – technologies that provide learners and students with self-learning and just-in-time information wherever they are located (Ally, 2005). Mobile technologies:

Instructional websites with such capabilities are encouraging and attractive in their own right, but the extent to which the custom design can actually be tailored to meet learners' needs remains unclear. Most importantly, learning effectiveness that can be attributed to the design is still open to questions... (Hsu, Lin, Ching & Dwyer, 2009:272).

Hsu, Lin, Ching & Dwyer recognise that learners engage with learning activities from disparate perspectives. These varied perspectives emerge out of their unique socioeconomic and political backgrounds and learning styles. To this end, instructional technologies for mobile learning may be more inclusive and exclusive because learners bring different experiences to the learning process. Broos and Cronjé (2009) contend that in the dynamic environment of the “information society it is important that managers coach their workers to see the importance of change so that they want to change themselves and want to make a positive contribution to change” (288).

The contribution of mobile learning to changes in the information society is reinforced in the following interviewee responses:

Third world countries need to improve access to learning no matter where you are and what your profile is. While in the first world countries it is about

enhancing access to resources and the volume of resources to learn more creatively and more individual solving of learning tasks in terms of the uniqueness of the resources. That is, the use and collaboration and cooperation in terms of interaction between learners and learner groups creates more communities of learning and communities of practice, through using the communication possibilities of mobile devices. So it is all about enhancing the learning environment and the resources available (Respondent 2).

Technology empowering learning in certain instances, it is with a PC and is user friendly. Obviously, learners have to use your PC or laptop, but the mobile device is there, they don't have to go there inside the lab. If a learner wants to sit under the tree, he can take the computer under the tree. If he wants to tour with the bus from here to somewhere, he has his portable computer with him. Eventually, in the form of communication, open channels, because most lecturers at this stage they have got two hours a week, so those students can come and see them. There can be a way with technologies that the students can get real-time information and real-time support. The technologies will help a lot (Respondent 1).

Technology empowerments are the basic premise behind the mobile education drive – user-driven access (Respondent 4).

Technology empowerment can easily blend into students' daily lifestyles (Respondent 5).

Respondents 4 and 5 show that mobile learning empowering learner in their learning and daily lifestyle. These developments have caused mobile devices to become strategic tools with the capacity to deliver Higher Education by means that were never anticipated when the first prototypes of these mobile devices were designed and marketed. The fact that educators are able to deliver successful Higher Education products to the present generation of young people by means of technology that these learners have distinctively adapted for their own personal (mostly social) purposes, makes it a particularly potent tool for the delivery and reinforcement of content that would otherwise be identified with the Higher Education establishment. It is one of the ironies of technological history that modes of communication that were spontaneously developed by the younger generation have been subverted to serve the purposes of Higher Education. Alexander (2004) pointed that such structural

changes in the delivery of Higher Educational content give educators powerful tools to make delivery more efficient, personal and culturally acceptable.

SECTION 3

IMPLICATIONS OF THE MOBILITY OF LEARNING

5.3.1 Introduction

Conventional computer technology requires expensive infrastructure and equipment, e.g. computer centres and personal computers (PCs), that are fixed structures and in permanent locations. Learners queue for space and the Internet connection is often slow and unreliable due to a large number of learners accessing it at the same time. The challenges with conventional technology help to position mobile learning as the most viable solution, because people use electronic devices in physical and virtual classrooms, and this is where mobile learning integrates with e-learning as self-directed learning. Hence, mobile learning cannot be separated from e-learning; these media are not different or in isolated categories. Generally, the use of technology occurs in conjunction with what is happening between students and lecturers, and what they are doing individually in physical classrooms.

Mobile learning enables self-paced learning, and is not at this stage part of the formal curriculum. It is an enrichment opportunity, for students to learn something extra and to gain additional information. Self-paced learning offers students the choice of going online using mobile technology. Students who are driven to succeed in their studies will use it to a significant extent. Mobile learning increases time on task – learners tend to spend more time with the content.

Koole (2009: 39) draws the elements of the mobile learning process from the literature in terms of the mediation of learning, information access and selection, and knowledge navigation, as shown in Table 5.18.

Table 5.18: The mobile learning process

(Adapted from Koole, 2009:39)

Criteria	Examples & Concepts	Comments	Implications for this study
Mediation	Task artefact cycle, mediation.	The nature of the interaction itself changes as learners interact with each other, their environments, tools, and information.	Mobile technologies may provide for multi-learning spaces.
Information Access and Selection	Information noise, identification of patterns and relationships, relevancy, and accuracy.	As the amount of information available increases, learners must increase their efforts to recognize and evaluate the appropriateness and accuracy of information.	Learners are searching and facing problems that allow them to learn with mobile learning spaces.
Knowledge Navigation	Knowledge production vs. knowledge navigation. In knowledge production, teachers determine what and how information should be learned.	In knowledge navigation, learners acquire skills to appropriately select, manipulate, and apply information to their own unique situations and needs.	Mobile technological efforts enable knowledge navigation, transfer and sharing with mobile technologies.

The research contribution of this study to the field of mobile learning is highlighted in the fourth column of the above table: mobility of learning contributes to the learning process in that mobile technologies provide learners with multi-learning spaces. Mobile learning allows learners to access and search for information, solve problems, and transfer their learning via mobile technologies at anytime and everywhere without having to wait for access to computer laboratories in the university. Mobile learning opportunities allow students the freedom to navigate, transfer and design their own learning and instruction, using multiple resources and communication possibilities.

In exploring the mobility of learning, findings emerged on the following topics:

1. Mobility of learning vs. teaching
2. Mobility of learning methods
3. Mobility of learning and classroom learning
4. Mobility of learning facilitation
5. Mobility of learning activities
6. Mobility of learning outdoors

7. Mobility of learning shifting between formal and informal learning
8. Mobility of learning and mass media technologies
9. Mobility of learning and mass media controls

5.3.2 Mobility of learning versus teaching

There is a growing debate on the meaning of the terms 'mobile learning', 'mobile teaching' and 'mobile instruction'. This section discusses the findings in terms of possibilities in the mobility of learning environment – including teaching, instruction and learning – around the following issues:

1. The essence of learning and teaching change when the medium is changed.
2. A new pedagogical approach is to promote "navigationism – beyond constructivism" (Brown, 2006:1-14).
3. Integration and involvement of mobility of learning.

Kukulska-Hulme and Traxler (2005a) indicate that the term 'mobile learning' brings with it a shift in focus that may impact on educators and trainers: "it is mainly learners who carry the mobile devices and move around with them, whilst the term 'mobile teaching' is hardly used at all" (25). This separation of meanings contrasts sharply with the way that 'web-based learning' and 'web-based instruction' have generally been used with equanimity alongside 'web-based learning'. So the starting point is an emphasis on learning, but a focus on mobile teaching would redefine the process as the facilitation and support of mobile learning.

In reaction to the interview question, Respondent 2 argues against the possibility of teaching via mobile technology as follows:

One could with mobile technology, but I would be hesitant to do so. The reason is that the essence of learning and the essence of learning facilitation change when we change the medium of learning or teaching. However, principles and the theories remain the same – it just enhances and provides more opportunities and more possibilities and more flexibility. The pedagogy is the development in knowledge management; in the knowledge era people live as they live in the information technology era. It is not about the medium itself, whether it is mobile technology or other kinds of technology, but the abundance of technology that is available and how that impacts on the way one teaches and the way one learns. Fifty years ago it was all about a teacher deciding what is the best content of this course and what should the learner

learn and memorise; and they will select the content, provide that piece of content to the learner. Twenty years ago it was about providing a boarder amount of content to the learner, but facilitates and learner to reach the outcomes. The content is just a means to reach those outcomes while moving towards thoughts on navigationism theory – something beyond constructivism, where it is not about specific content, but about how you navigate in the abundance of the information that is available, to be able to reach certain outcomes, to be able to solve problems and communicate those solutions to the people around you. The most important thing is not the construction of new meanings, but using existing knowledge and the information that is available, to integrate it and manipulate it to find solutions to life problems and world problems (Respondent 2).

Against the first response statements: integration and involvement, don't take things that work away if that works – leave it and just add something new and the involvement of learner, learning material and the educator. In the biology subject area, as an example, what do want people to learn with mobile technology? – everything in the subject content, the practical side and ethics; and to get all of that with mobile technologies, which is very possible – by putting the learning in the hand of the one who wants to learn (Respondent 1).

I support the idea of integration as learning with mobile technology can easily blend into their daily lifestyles (Respondent 4).

The content should be controlled by the lecturer, facilitator or 'gatekeeper' as is the norm within the traditional classroom (Respondent 5).

Respondents 1, 4 and 5 echo that it is possible for the learners to use their mobile device to any subject content creating layers of learning methods. That mobile device is being a part of their daily lifestyle. However, mobile learning might be facilitated within classroom learning. Also the hallmarks of mobile learning: 'anywhere, anytime, and any wireless device'. On the other hand, they hinge on the issue of learner-centeredness as oppose to teacher-centeredness, questioning the legitimacy of learning indicators such as highly situated, personal and collaborative (Cobcroft, Towers, Smith & Bruns, 2006:21).

5.3.3 Mobility of learning methods

To distinguish between the mobility of learners and the mobility of learning, this section discusses the findings that emerged according to the following issues:

1. Providing a problem, and the learner choosing the right technology to solve that problem
2. Multi-methods – not isolated, or one method or style
3. Self-paced learning
4. Increasing learning time and locations

In their seminal handbook on mobile learning, “Kukulska-Hulme and Traxler (2005a) argue for the integration of that the design, planning, implementation, and evaluation of the use of mobile technologies to achieve success. Mobile learning might not suit all learners and every situation” (Cobcroft, Towers, Smith & Bruns, 2006:65).

The learning method is the learning tasks provided to the learner and is the key driver behind those methodologies. If one creates an environment where one provides a problem that the students have to solve that they can only solve if they use the right type of technology, using all the information available that they can find, then it is successful as a learning task (Respondent 1).

The method should be collaborative and again involvement of technology by learners. Methods cannot be isolated or identify only one method or style; the use of mobile learning in each and every style is a method, so it is multi-method (Respondent 2).

From the above quotation, it is evident that “as the amount of information available on the Internet grows, it is increasingly important for learners to be able to identify relevant and accurate information” (Koole 2009: 39-40). They may be able to interrogate the avalanche of information they access online, synthesising and comparing the different discourses subsumed in the information (Pineteh, 2010). This is a useful process because it assesses the meta-cognitive ability of learners especially in the way they interpret and negotiate meanings from different texts. These responses also postulate that “through the application of mobile technologies within the learning design, students to undertake ‘user-led education,’ creating their own content and collaborating with peers and communities within and beyond the classroom” (Cobcroft et al., 2006:25).

5.3.4 Mobility of learning and classroom learning

This section aims to distinguish between classroom learning and the mobility of learning, finding similarities and differences. The findings are listed in the following table:

Table 5.19: Mobility of learning

Mobility of learning
Includes providing learning problems
Learners are active involved
Cognitive involvement
Facilitators
Absence of face-to-face interactions
Isolation and frustration
Virtual interaction

The reason for drawing attention to these differences and similarities is that in the literature on mobile learning, Cobcroft et al. (2006:21) point out that “the rapid developments in information and communications technologies (ICT) and evolving learner behaviours require learning institutions to continuously reevaluate their approaches to pedagogy, both in the physical and virtual ‘classroom’ spaces”. Here, educators likely constantly reflect on their practice to ensure that their teaching approaches are still able to cater for the different needs of the learners. The management of these institutions should also be more innovative and constantly promote quality at all levels. This is articulated in the following quotation from a respondent in this study:

Mobile learning and classroom learning – in a way they are not different at all; learning remains, and the definition of learning remains, and the construction of new meanings. The only difference is what we do currently and in future what we will do is not about providing content, it is about providing the problems that need to be solved and assisting the students to solve those problems with what is available in terms of technology and information (Respondent 2).

In the first place the educator becomes the facilitator and not the talker, because now the students work independently and in groups. The teacher, the educator becomes the facilitator moving around instead of doing the chalk and talk at the same time. That is a huge difference for the learner; again it's involvement in the study material, active involvement, not only using the eyes

and the ears, but they get cognitive involvement in the study material
(Respondent 1).

This respondent claims that, the absence of face-to-face interaction is one of most criticised features of learning via the Internet, although it may reduce the anxiety of some students regarding answering questions in traditional classrooms. The isolation of online learning was one of the main frustrations associated with online learning before synchronous communication technologies (e.g. video/audio conference) significantly accelerated the processing of multimedia signals. And asynchronous communication applications (e.g. online discussion board, e-mail, blog ...etc.) are still used popularly in schools (Cobcroft et al, 2006; Pineteh, 2010).

That is, indirect interactions are still the mainstream in e-learning. Besides, online social supports may come not only from teachers, peers and friends but also from unknown individuals around the world. Teachers in an online learning environment become more like facilitators and helpers. In particular, the beliefs and expectations of online teachers may not be perceived by students as easily and strongly as in traditional classrooms. The above challenges require students to develop new strategies to cooperate and negotiate with others via the Internet. They also need to understand the changing teacher's role and possess new attitudes, motivation and approaches to interact with varied online social supports (Tsai, 2009:37).

I argue that mobile is not less than the classroom, though it is happening much less in the classroom. Students get the same information on mobile that they get in the face-to-face situation, because mostly mobile is used in a blended fashion so it is not just classroom learning or mobile learning. It is used in a blended way with a little bit of each by making it engaging – finding an addictive user experience. So one can't really distinguish the two
(Respondent 3).

The foregoing articulation indicates that mobile technology may bring various advantages. Firstly, Mobile devices help improve literacy and numeracy skills of learners. Mobile learning also “encourage independent and collaborative learning experiences; identify areas where learners need assistance and support; mitigate resistance using ICTs; engage reluctant learners; enable learners to remain more focused for longer periods; and promote self-esteem and self-confidence” (Attewell, 2005:13-15). Secondly, easy access to information from different sources and on different topics is one of the greatest advantages of Internet-based learning. Today,

students immediately retrieve information from around the world if they have access to the Internet. However, “the quality of online information varies significantly and information stability and authority differ markedly from that in a traditional classroom” (Tsai, 2009:38).

5.3.5 Mobility of learning facilitation

The findings on how facilitators work to moderate the mobility of learning are discussed around the following issues:

1. Provide an introduction in the form of learning task/s that require learners to use mobile technology.
2. Design an online manual to be accessed via mobile devices.
3. Flexible learning.
4. The facilitator’s role is to make learning material available, make it attractive and easy to access.
5. System management should be linked access to mobile technology.

The danger of easy access to information is the increase in unethical practices such as plagiarism. The availability of information is taking away learners ability to think and apply their minds during the process of learning. Instead, they have become more susceptible to ‘cut and paste’ (Pineteh, 2010). Students need to know not only how to search for information via the Internet but also how to evaluate, integrate and judge the information they find. How to process and utilise online information is a new issue for online learners (Attwell, 2005; Tsai, 2009). In addition, the “explosion of online information could result in anxiety – this may be another challenge to be handled by some online learners due to the abundant information resources provided on the Internet” (Tsai, 2009:37). This is articulated in the following quotations from a respondent in this study:

Mobile learning would be facilitated learning by providing the learning tasks that require the students to use the mobile technologies available, to be able to solve that problem (Respondent 2).

An example of practical mobile learning facilitation would start by an introduction with a few tasks to do in class depending on the situation. Give the students a task for them to take the mobile device and either work in groups or individually depending on the task they are doing. They sit together, or go to the library, or go to the computer lab, or go under the tree, wherever

they want to go. They gather information for the task. They compile a document or some feedback on the PDA, on the computer or whatever they want to use, even if they want to use pen and paper is better for them; these are mobile tools. Then after a day, or an hour, or whatever the case may be, they return to the class and they give feedback by presenting their findings with a facilitator assessing that. It is not only the facilitator's assessment – the whole class assesses each other and every other presenter. So facilitating that would be by being in the class to help, joining the groups to see whether they are doing what they needed to do (Respondent 1).

To facilitate is to make learning materials available, to make them attractive to students and easy to access. Learning material workable be attractive to students – it needs to add value. To support these arguments by giving another example of facilitation, the institution should do what the following respondent describes:

Students should have a type of online manual made available to them during the course of the term, which will allow for interaction with the course content on the mobile device as well as to encourage the learner through the learning process with the use of an informal assessment application (Respondent 3).

Summarising the mobile learning facilitation processes as follows: set a task; assign the timeframe; follow-up; feedback (Respondent 4).

Feedback can be returned in different forms – messages; management system linked to the technology; discussion forums and response to the system (Respondent 5).

From respondents 3, 4 and 5, is that mobile learning possibly to be facilitated easily through designing a learning system that have essential role for providing learning with immediate information on the learning task.

A recommended learning management system “can provide objects easily and efficiently, thereby enhancing learning activities. Without recommended mechanisms, learners would spend more time selecting suitable learning objects and less time involved in the actual activity of learning” (Yang, Huang, Tsai, Chung & Wu, 2009:50).

5.3.6 Mobility of learning activities

In terms of the mobility of learning activities, a good strategy is to incorporate knowledge management in running an online course, such that elegant materials created by previous students can be accumulated from semester to semester for the benefit of later students. A study by Chen and Tsai (2009:1) indicates that “an online course is delivered in the form of digital resources: every piece of digital material can be archived and every activity can be tracked and logged” (1).

However, in mobile learning activities, lecturers document their own complete digital teaching portfolios for later reuse, or even to add value to their online courses, thus enhancing their teaching efficiency and performance.

This section reflects the nature of the mobility of learning activities, as a result of the mobility of learners and the mobility of technology. The following issues emerged as findings:

1. Collaboration with peer learners and facilitators
2. Interaction via SMS and MMS
3. Sharing information via Bluetooth
4. Social software interaction such as MXit and Facebook
5. Playback at a later stage

The following comments from the interviewees reinforce these issues in terms of the mobility of learning activities:

Mobile learning activities include collaborating with peer learners about the problem that was given, about the information they want to use, and about the strategies they want to use – learning activities about the collaboration, about the sharing of resources such as taking photographs and posting that on a central website. They have more access to communicating with an expert who is not in their environment. However, sitting ten thousand kilometres away from an institution, they should have access to that person on Facebook or Mixt or whatever technologies are available. Learning activity is about collaboration, interaction, sharing, publishing, and publishing of solutions and content, and those kinds of activities (Respondent 2).

Respondent 2 suggest that mobile learning activities includes collaboration, interaction, sharing, publishing, those kinds of activities be accessed via the Internet

by social software such as Facebook and Mixt. However, students are using these software in a fieldwork in a university of technology as the respondent describe them below as:

In our university case it is easy, because they work in nature doing fieldwork. They have to identify a given picture, to find things and identify them – finding information about trees, animals and plants. They are very practical and visual assignments. For these assignments, the learner who decides to do them on mobile technology, for them, it is better, because no one accepts a handwritten assignment any more – it must be typed and they do it on the PDA. Afterwards they go back to class and have group discussions. Moreover, students Bluetooth their assignment to the facilitator's computer, when they still have it on the PDA. Another example, by giving them multiple-choice questions, they can still answer it using their PDAs. Therefore, students learn on their own as they answer the questions at their own pace. That is the advantage, as immediate feedback and 100 percent participation in class asking questions, is not possible. However, if they are not willing to discuss in class, they put it in the PDA and send the questions via Bluetooth to the facilitator's screen. Then together they can discuss it, which encourages 100 percent participation. Podcasts are an activity that can really work. Also as SMS quiz type thing, where the students receive an SMS with a question and can SMS an answer back. Then they receive feedback. These types of communication and feedback are not commonly used (Respondent 1).

Respondent 1 provides evidence that in mobile learning activities in a university of technology, learners do some learning tasks and activities such as typing text, recording videos, taking pictures, that outside the university campuses, and then sending these information to the facilitator's computer. However, for these activities learners are using PDAs for learning, as podcasts are an activity that can really work.

Learning activities for mobile learning are things such as question and answer; drill and practice; investigation – collating info; recording an experiment for playback at a later stage – these are a few examples. The choice is open (Respondent 5).

Respondent 5 provide and evidence that the learning choice is open for learner in learning with mobile technology. In this excerpt, the respondent represents the current mobile technology “as development in the form of an Inquiry Learning Toolkit

running on small touch screen computer-phones, with integral cameras and keyboards to enable learners to investigate personally relevant questions outside the classroom, by gathering and communicating evidence” (Anastopoulou et al 2008:12).

5.3.7 Mobility of learning outdoors

There is a potential for integrating the mobility of technology, learners and learning in promoting outdoor learning. These findings are discussed in terms of the following issues:

1. Fieldwork is a good example of outdoor learning.
2. The internet-on-the-go is available on mobile technologies to support informal learning.
3. Theoretical tasks are usually classroom activities, while practical activities can be outdoor activities.
4. The mobility of technology integrated with a MXit chat enable informal learning outside the classroom.
5. MXit enables learners to communicate and facilitators to moderate and monitor learning with immediate feedback.

A review by Hughes (2008:341) shows that since 2004, Personal Digital Assistants (PDAs) with integrated GPS functionality have become widely available. This marriage of technologies led researchers to investigate how mobile devices could be used to engage young people in outdoor learning. These issues are reinforced by the following comments from respondents:

Mobile learning outdoors such as fieldwork is a very good example of giving learning tasks, which require the student to do and record certain activities outside the classroom, and then sharing what they have done. For instance, as mentioned earlier, like sending the student to a certain laboratory in Johannesburg and asking them to identify the problems at that laboratory they might be experiencing with power, electricity and equipment. They take photographs of what the problem is, discuss it, design a new solution for it, and come and report back in the classroom everything they found – they took photographs, maybe recorded an audio. So let the students use the mobile technologies available to solve the problem you gave them, and then come back and report on it using the mobile technologies and things they created (Respondent 2).

If the students have the devices they can go on the Internet and search for things in the form of informal learning, if they want to look at something. But everything is formal learning, if it is part of the university syllabus, or it is part of a subject. It is interlinked between what they do in theory and what they have to do in practice. Often in a university the theoretical part is in class, and then they must do the practical part in a laboratory or outdoors, for instance, the practical experience outside the classrooms and lecture halls (Respondent 1).

Most of mobile learning activities are taking place outdoors, in the field, as an example. It is happening outside the classroom – mobile technology linked with social software like MXit. And mostly, every single child in South Africa who has a cell phone is on MXit, because they can chat for free. However, nobody actually taught them in the classroom how to use a cell phone or MXit. That was self-paced learning. All of those learning technologies made those people download the MXit application and they are using it on a daily basis, as informal learning outside the classroom. Therefore, informal learning with technology 'outdoors' takes place a lot more than formal learning 'indoors' (Respondent 3).

Therefore, mobile technology be used mostly as a resource outside of the classroom and in a classroom situation. There is another side of technology use outside of bounded areas in the form of mobile learning relevant to outdoor learning in particular, as reflected in the following response from an interviewee:

The mobile technology is linked to a MXit system, which enables the educator to monitor and manage the learning process. Messages can be sent to learners to encourage participation (Respondent 5).

Researchers investigated the use of available technology such as MXit – the popular South African mobile chat-room – as a possible cost-effective solution for the educational problem of poor infrastructure. Education 2.0 technologies were used by way of MXit, but may also be used in a conventional fashion.

In this case, mobile learning increased learner participation by completing quizzes via a MXit-based model linked to the LMS. The learners were expected to choose the quizzes they wanted to complete from a list provided. MXit was used as a delivery channel for some institutional projects, which found in a South African project that:

- MXit has shown phenomenal success with over 5.8 million subscribers currently, 45% of whom are in the 14–18 age group. This meant many learners were expected to already know how to use MXit. So the project was using contemporary and popular technology.
- The cost of MXit was very low, compared to SMS. According to the project documentation, MXit chat costs about two cents, as opposed to 80 cents for an SMS message of the same length. This means that MXit is considered to be an affordable, sustainable technology.

Popular media attention has focused on some of the negative issues regarding mobile phones, particularly in the hands of young people, which poses another challenge to mobile learning. Many institutions in “South Africa are either banning mobile phones from institutional premises or locking them away during academic hours. Popular instant messaging services such as MXit are very popular amongst South African youths” (Botha, Traxler & Ford, 2008:53-54). Here, technology is seen as disruptive especially during classes because learners tend to use it for play rather than learning (Dron, 2007). In addition, these institutions blame the increase of pornography and violence on easy access to computer games and sex footage from mobile phones or computers. This reminds us of the nineties where social media were the subject of controversy especially in the developed world. In the context of South Africa however, “the major difference is that mobile phones are the device of choice... versus the ubiquitous networked computer in the developed world” (Botha, Traxler, & Ford, 2008:53-54).

5.3.8 Mobility of learning shifting between formal and informal learning

The growth of mobile learning and wireless technologies has ushered in the possibility of shifting between formal and informal learning that includes the emergence of social media and social interactive software such as web 2.0 technologies. The mobility of learning in terms of formal and informal learning, depend on the learning tasks and requirements provided as mobile learning. The findings are discussed according to the following issues:

1. Informal learning was previously merely incidental. Now informal learning is integrated with formal learning, for the possibility, flexibility and future priority of mobile learning.
2. The use of informal learning strategies can enhance formal learning.
3. Mobile learning provides learners with information they need.

4. Mobile learning enhances accessibility and playful engagement with learning tasks.
5. Mobile learning allows the possibility of integration of formal and informal learning.

Some results from Dron (2007) suggest that in Higher Education, a challenge is to design social technologies that allow for bridging different pedagogic goals (control of learning) and ways of communication between the different actors in the learning environment. These aspects require more than designing services just to connect people and content, “but also to create new didactic sequences and educational activities that can connect formal and informal learning settings” (Milrad & Spikol, 2007:69).

Mobile learning shifts between formal and informal learning that is reinforced by the following comments from the interviewees:

Informal learning in the past was just incidental; informal learning now becomes more an integral part of the learning process and may even be a priority in the future, because of the possibilities and the flexibilities that the new technologies provide to teachers and learners. There is a shift in importance between formal and informal learning, not the importance but the use of informal strategies and environments to enhance the formal learning environment is definitely growing (Respondent 2).

Mobile technology provides learners with information that they need about their learning context. Mobile technology provides a part of the Internet, if learners can go on the Internet with cell phones, and they do. With their cell phones they obviously need a Wi-Fi spot to go on the Internet. But sometimes, the facilitator makes the information available on the PDA as a device, for example, providing information for everyone, such as maps of the route, programmes and information about places. Learners need this information before they get there. Therefore, they can add extra information to that; this is sort-of giving information on the mobile device. It worked for me prior to a training trip or field trip. It is part of the facilitator's and learners' jobs as a part of knowledge building (Respondent 1).

The above responses provide evidence that it is now easy for lecturers and learners to communicate via mobile technologies; accordingly, however, lecturers mostly

choose to stand in front of their students, rather to communicate via technologies. This is an opportunity for both lecturers and learners to integrate formal knowledge and informal learning wherever possible. Integrating formal classroom-based learning with informal learning can add value to formal learning experiences:

The notion of information accessibility and playful engagement with the content, before and after the formal lecture in the classroom, would make more opportunities for the integration of formal and informal learning (Respondent 4).

Finding a reason for these integrations is that the keyword is integration – this is how learning takes place in life. Informal learning must be integrated to enhance the learning experience (Respondent 5).

The above responses provide evidence of the integration of formal and informal learning as a result of mobile technology, which is rapidly changing and influencing youth participation in cultural production and negotiation on a global level. The need to understand the relation between digital media and learning is urgent, because of the scale and the speed of the changes that are afoot. The role that mobile communication media can play in the development of cross-cultural awareness needs to be explored in formal educational and informal learning spaces. At the very least, researchers have shown that mobile phones have a place in the creation of meaningful, user-generated content for improved cross-cultural awareness and communication. Certainly, as communication media devices, they have progressed “from text to context”. More research is needed in this space (Botha et al., 2008:46).

5.3.9 Mobility of learning and mobile mass media technologies

Social media such as Twitter and Facebook, and other web 2.0 technologies are growing rapidly in popularity. The question is how these new mass media opportunities, which are accessible from mobile technologies, are being used for learning and development. Ramsden (2008:358) found that a large number of respondents reported that they integrate Twitter with other software, including personal blogs and Facebook. The rationale offered was efficiency gains and widening the audience. However, some people started to question if these technologies do add value. There appears to be a conflict between the social networking and reflective blogging aspects. However, 82% of respondents were conscious of different audiences when twittering (Ramsden, 2008:358).

The mobility of mass media technologies is discussed according to the following issues:

1. Mobile mass media technologies open up the scope of resources that are available.
2. Information and communication are accessible via mobile social media technologies such as ITube, YouTube, TV, DVDs, Facebook, Twitter and newspapers. They are one-to-one, one-to-many and many-to-many communications.
3. Mobile mass media can be used for demonstrations, sharing, discussion forums and learning-by-doing exercises.
4. Mobile mass media provide immediate positive rewards.

Mobile devices “employ instructional design aspects using artefacts provided by some designers, taking into account the following elements: the advantages of mobility and portability of devices, the use of wireless communication to share real-time information and resources” (René & Gabriel, 2010:17).

Responses from the interviewees reinforce the importance of mass media technologies:

The most significant advantage of mobile mass media that is available is the opening up of resources that are available. Many subjects don't prescribe specific textbooks anymore – they provide the learning outcomes that need to be achieved. The student can find their own resources to achieve those outcomes and mass media is one of the means of access to resources that many students would not have had if they were just in textbooks (Respondent 2).

An example is if students can get access to the Internet wherever they are as part of the mass media on iTunes or YouTube or whatever they can't keep up with that. It affects their learning formally and informally. Students describe that they watch things on TV, documentaries or even movies, and give some feedback on what they do outside. TV can also be mobile because it is all over. I think, it's affect is positive but it can be negative as well; it depends on what you as the educator expect from the learner if you ask them to go out and take out a DVD, watch it and answer this question about that DVD, or a learning task such as reading the newspaper to get this and this information. This is also mass media. That is a positive thing – if the educator uses the

opportunities of that mass media in the learning context in a way that it can add to the formal learning of students. Obviously by just looking around and just reading and watching it can be informal learning or lifelong learning (Respondent 1).

One wonders if there is a student who isn't on Facebook or Twitter; they are definitely on those. Those media are used informally between people. For example a few students have added their lecturer, so he/she can see what happens on their Facebook profile. Some of them exchange information about upcoming tests or assignments and so on, online on Facebook as an informal way; it is social networking, which is not used in a formal way in the class (Respondent 3).

The design of mobile mass media is demonstrations, discussion forums and learning-by-doing (immediate application) exercises. Improved personal touch and communication should somehow be evident in the application (Respondent 4).

Mobile mass media provide positive rewards for small achievements (Respondent 5).

Respondents 3, 4 and 5 articulate that most of universities learners are on social mass media as Facebook and Twitter. They create their own personal profile on these social media. They design material for online use and communicate via the Internet through the social mass media. They have achieved the work that they do via the social mass media.

A common theme was "there is stuff I can't twitter or say because I wouldn't want it to reach the wrong audience". Overall, these and other findings make an important contribution to the debate. They inform us about people's attitudes to using Twitter, Facebook or other social media and their thoughts on its potential role in education. This is important as a better understanding of these issues will help inform people if Twitter is appropriate and how to implement it in their own teaching and learning.

5.3.10 Mobility of learning and mass media controls

Many respondents complain about students accessing some websites that are socially unacceptable. This section investigates how educators in Higher Education can control and limit such problems, as well as the causes and effects of such concerns, since mobile learning mass media of the social media may dominate the future of learning.

The findings on this topic are discussed according to the following issues:

1. Controlling mass media depends on the goal of the course.
2. The facilitator may restrict the learning environment provided to learners.
3. The value of mass media technologies is that everybody is involved and can participate.
4. If the students are working online they can access everything, including pornography, that can be accessed anytime and everywhere.
5. The danger of mass media is that no one can lock it.

Part of an educator's duty as teachers is to occupy the student with enough learning work that is of interest to the student to learn, so that the student doesn't have time to do things that they should not be doing according to the university ethical rules. Teachers have ways to limit such undesirable behaviour, but no one can stop it. Apart from playing games during sessions in which they are expected to work, there are other frustrations.

Controlling mass media depends on what the goal of the particular course is. If the goal of the course or the aim of the course is to help the student to make the most and best use of the restricted learning environment that is provided to them, then they may restrict it, with the aim to assist and facilitate learners to be creative. In that way, they find resources and they solve problems. Then facilitators might restrict the environment. So it depends on the aim of the course and the possibilities of the learner group that you have in the course in terms of flexibility, mobility and access anytime any place (Respondent 2).

The value of mass media is that the students get involved in all the material – some may want to learn not only looking at the teacher in front of the class. By making it interesting for them, even if it's just to play a game, but the thing is they have hand-in-hand this technology; most people like technology and they can manage their own learning process. They can learn in their own time, the

value of that in this case is we're working with small numbers of students. The value of mobile mass media technology in class is that everybody is participating. It is not only the four or five bright ones who participate in class everyone must participate. Sometimes, it is better for them to have a question from the lecturer asking for immediate feedback; anonymous or whatever the case may be. If there are 30 students, the lecturer must expect 30 feedbacks, even though in a discussion there are always the few who will not participate. So the value is that everyone can work, everyone participates and everyone can learn in his or her own time (Respondent 1).

If students are working online, they are going to access everything – pornography, you name it, so in that way one cannot lock them. It is quite possible that they can access improper material and they probably do. The fact that they can access it anytime any place; if they are sitting in a bus for an hour between one campus and another campus, they can actually use that time and listen to a lecture, surf the web and get information. That is important for them. Also the fact that they can share easily, and friendly information and they can keep in contact. Educators must not forget how contact is important between two people and what can actually be nice is when lecturers start using mobile technologies to keep in contact with their students (Respondent 3).

The above responses suggest that the traditional learning environment might be completely revolutionised by alternative methods of coordinating all the activities that together constitute the experience of Higher Education. This can be done for large numbers of learners who, for one reason or another, are unable to afford the experience of Higher Education on the traditional campus. Even though the experience of Higher Education that is mediated by sophisticated mobile devices is different in many fundamental ways from the traditional educational experience, such differences imply neither inferiority, nor constraints on the possibility of achieving excellence in theory, performance and application. The transmission of Higher Education by means of mobile devices adds various elements that are uniquely enriched by the medium itself.

For example, Beale (2007:16) notes that “technology does more than simply record the activities; it informs learners' choice and connects communities with each other”. Interpersonal communications, contacts and debates, to cite three examples, may be

more intense on mobile devices than among students who attend lectures on physical campuses.

However, Winters (2007:9) phrases it thus: "Mobile applications are best viewed as a mediating tool in the learning process". Also, Laouris and Eteokleous (2005:3) are unequivocal in their belief that most future learning will take place by means of highly developed mobile devices. Their belief is that people will have to face various critical issues "in the next few years [when] the mobile phone will be the primary source for radio and television signals, as well as the link to up-to-the-minute information" (3).

This research investigated the influences and effects of the "hidden curriculum" that is mediated by means of multimedia and mass media such as television and the Internet. This research is motivated by the belief that these mobile mass media have forever changed the manner in which people learn, perceive, understand and communicate with others, and that some of these new modes of absorbing and exchanging information may be turned to the advantage of Higher Education delivered through the medium of mobile devices as mobile devices that are changing the way people learn.

The use of mass media as attitudes: entitlement vs. responsibility. Needs: education toward responsibility in being educated. Preferences: immediate feedback and encouragement - the epic wins of the gaming community are becoming the expected norm (Respondent 4).

Mass media encourages independent study – dedication, motivation to succeed (Respondent 5).

The principles of learning theory will have to be adjusted and expanded to accommodate these new epistemological modes and methods of learning. The pedagogical implications of new methods of exchanging information in teaching and learning for both educators and learners will have to be very clearly described and understood. The ease with which students can access information and the sheer volume of information available on the Internet and from other electronic sources compel educators to be meticulous in their investigation of how the processes of teaching, learning and interpersonal communication can best be presented, so that the disadvantages of receiving information by means of mobile devices can be minimised and the particular advantages unique to the medium can be maximised. The ultimate ideal is that information can be relayed by the same systems that now so

efficiently maintain the innumerable channels of mobile technology that transmit electronic information by means of a system of stationary global satellites. Universal access also unfortunately means access to information that can subvert the processes and ideals of the best practice in Higher Education, as well as morality. The challenge remains to place Higher Education mediated by mobile devices on sound ethical and pedagogical foundations and, in so doing, to instil in students a fundamental appreciation of the philosophical values that have informed the best educational practices in western culture since the time of the ancient Greeks.

Katz and Liebes (2007) criticise education that is mediated through the medium of mobile devices by pointing out that the ubiquity of cynicism, disenchantment and segmentation that is characteristic of the modernist media of the age in which modern people live, undermines an appreciation of the richness that can be obtained from face-to-face contacts with real-life human beings in learning situations. They draw attention to the fact that the ubiquity of television technology can be a disruptive factor in the lives of susceptible learners. Television images are themselves highly mobile and accessible and they affect every part of learners' modern environment, whether formal and educational, or informal and social. Katz and Liebes (2007) point out that such changes in the very structure of our lives subvert the advantages that be obtained from face-to-face contact between students and their teachers. They point out that these structural and institutional changes in the very fabric of society in that they:

- *...Diminish sociability among viewers and only produce a facsimile of sociability among those who share broadcasted information;*
- *Have deprived live broadcasting of its advantage of novelty;*
- *Have socialised us to accept isolated 'action' rather than face-to-face interactions with other real human beings... (Katz & Liebes 2007).*

Researchers including Strömbäck, Shehata and Dimitrova (2008) have demonstrated that students who learn by means of technological communication devices are susceptible to distortions of reality that are facilitated by the very structure of the medium itself. It is therefore incumbent upon philosophers of education, educators, psychologists and sociologists to describe the unique features of mass electronic media and how they can exert either beneficial or harmful effects on those who are habitually exposed to them. When considering mobile learning in a wider context, educators have to recognise that "mobile, personal, and wireless devices are now radically transforming societal notions of discourse and knowledge, and are

responsible for new forms of art, employment, language, commerce, deprivation, and crime, as well as learning” (Traxler, 2007:2). Today we depend on technology for almost everything, anywhere and anytime. This has severe implications for the role of educational technology in our society. Educationists may constantly explore fresh possibilities that can ensure the wider and sustained development of mobile learning (Katz & Liebes, 2007; Koole, 2009).

5.3.11 Mobility of learning: social signs

Mobile learning technologies create a system of social signs, involving technologies, learning aspects, learner motivation, usability, user interface, media, social media, and multimedia that generate considerable change and conflict in learner mindsets and behaviours. Institutions have a role in demonstrating and teaching their learners how they may learn in such complex situations amid the chaos that could result from the use of social mobile media.

Koole (2009) describe the social aspect of mobile learning in the following table.

Table 5.20: The social aspect
(Adapted from Koole, 2009:32)

Criteria	Examples & Concepts	Comments	Implication for this study
Conversation and Cooperation	Social constraints; 4 maxims (rules): quantity, quality, relation, and manner.	Affects quality and quantity of communication; miscommunications may occur when any of the maxims are not met.	The myth of mobile learning technology creates signs that confused learner’s understanding of the modern social media scope and legitimacy
Social interaction	Conversation as a cooperative activity, sharing of signs and symbols.	Agreement on the meaning of signs and symbols may affect reinforcement of social and cultural beliefs and behaviours.	A mobile system of signs and symbols can affect the way learners learn and act in terms of social cultural interaction.

The implication of this study, shown in the fourth column of the above table, shows that it is important to realise that there may be constraints upon participants in a conversation. Such constraints provide guidelines and predictability for behaviour that enable effective communication. When a person joins a new community, he must share his own “sign systems” and learn those of the new community (Driscoll, 1994: 173). Cooperative communication requires that contributions are as informative as

necessary, accurate, relevant, and sufficiently clear. When a participant neglects to follow one or more of the rules, miscommunication may occur (Koole, 2009:32).

The previous discussion so far has implicitly focused on conceptions of mobile learning based on the culture and affordances of developed countries. Looking at the emerging practice of mobile learning based around phones and PDAs in developing countries, especially the poorest, a different picture emerges based on wholly different affordances. The radically different physical infrastructure and cultural environment – including landline telephony, Internet connectivity, electricity, the rarity of PCs, and the relative inability of societies to support jobs, merchandising, and other initiatives based around these prerequisites – has meant that prescriptions for mobile learning are more cautious than in the developed world (Kukulka-Hulme & Traxler, 2005a). It has also meant that mobile phones are now being recognised as the pre-eminent vehicle not only for mobile learning, but also for wider social change. It is entirely possible that the emergence of mobile learning in developing countries will take the evolution of e-learning along a trajectory that is very different from that in developed countries, where it has been predicated on massive, static, and stable resources (Traxler, 2009:16-17).

5.4 Conclusion

The field of mobile technologies engenders the need for a theory of mobile learning. Such a theory may be problematic since mobile learning is inherently a “noisy” phenomenon where context is everything. E-learning has certainly gained credibility from the work of many outstanding authors. Finding similar “beacons for mobile learning may be more challenging and proponents of mobile learning are still struggling to find a literature and rhetoric distinct from conventional tethered e-learning” (Traxler, 2009:16).

My research findings show that mobile learning has become a new temptation in teaching and learning. The evidence of an upcoming mobile learning era is overwhelming, showing that mobile learning was starting to take hold in the field of Higher Education learning technologies. The shift from e-learning to m-learning is marked by the shift from computer devices to mobile devices. Mobile learning as an emerging concept is seen as being part of portable and fashionable social lifestyles. Learning in the era of “the evolution of education and training can be characterised as a move from d-learning (distance learning) to e-learning (electronic learning) to m-learning (mobile learning)” (Kegaan, 2002).

This can be attributed to the practice of high quality teaching and learning, and increased numbers of people who need just-in-time learning and training. These issues allow educators to innovate many aspects of learning systems, methodologies and approaches regarding distance learning, electronic learning, and mobile learning. My research evidence that draw from the experts' interviews show that there is a new trend in the form of movement from traditional classroom learning, to distance learning, to e-learning and mobile learning.

To understand that mobile learning means the use of mobile devices in the learning process, this study found that the use of mobile technology depends on the context of the learner. Since mobile learning is a part of e-learning, both of which are integral parts of technology in education, the act of learning with mobile technology stays the same at any level of intervention. This research finding indicates that the act of learning does not change with the form or setting, whether it is face-to-face, e-learning or mobile learning.

It was found that it is very difficult to manage learning through mobile technologies. While the participants engage with the content on mobile technologies, new technologies rapidly become available. Mobile technologies provide the student with services inside and outside the university, particularly in rural areas. Mobile learning/technology can be managed if institutions have certain (specific) technologies that they can lend to students. Mobile technologies maybe integrated as part of holistic learning activities. Mobile technologies, and all other technologies, aim to help, to support and to teach students in context, to learn what they have to learn.

The pedagogical approach should be to design the learning tasks, right technology and right learning environments. The mobility of technology is supporting learning, that whereas the engagement when students face learning challenges and mobile technology pushing student to learn. Emerging mobile technologies and mobile learning concepts assume that mobile learning takes place any time and anywhere. Mobile learning occurs in open areas outside classrooms and lecture halls, thus enabling shifts between informal and formal learning. Universities willingly use mobile learning to support learners who use the devices themselves to share information.

People still learn within a particular context, by using the technology. Teaching possibly therefore is adapted to incorporate mobile learning technologies essentially as complementary learning tools. Although mobile technology does exert a pull on learners in terms of learning, learners use mobile technology spontaneously,

individually and collaboratively to create their own learning environment and learning tasks.

In a way, mobile learning and classroom learning are not different at all: learning remains, and the definition of learning remains, particularly the construction of new meaning. Students get the same more information on mobile devices that they get in the face-to-face situation, because mobile technologies are used mostly in a blended learning situation, so it is not either classroom learning or mobile learning. Mobile learning may be facilitate learners by providing learning tasks that would push the students to use the mobile technologies available, and to be able to solve the problems provided. Learning materials probably be attractive to students.

Universities workably plan, design and create mobile learning opportunities for students to learn in their own time and locations, since such technologies enable students to be online anytime and anywhere. Staying online and learning are crucial elements of learning with mobile technologies, and should be based on activities, new types of technology that students are using, and design-based tasks provided to students.

The new mobile technologies can help learners to seek, search, design and solve learning tasks and problems – thus creating their own learning environments and opening new horizons for various learning spaces as learning methods inside and outside institutional campuses. It means that students can learn whilst everywhere; it enables hands-free learning or eyes-free learning (Traxler, 2007). Mobile learners can engage in learner-centric activities because they are both mobile and there are more resource-rich learning environments, more flexibility, and more challenging activities. Mobile technologies give nomadic learners responsibility by involving them in mobile learning activities and continuous and sustainable processes; however, there is a need to teach mobile learners how to learn with mobile technologies.

Findings from respondents indicate that nomadic learners are very positive about mobile learning. Mobile technologies give them some responsibility by involving them in their learning experiences. Nomadic learners using mobile learning are varied in terms of their locations, age, level of technology use, availability of technology, and type of technologies to use for learning activities. The resultant learning depends on these various characteristics.

Universities expect mobile learners to learn with technology, which has resulted in the fact that learning with mobile technology needs to be a progressive and interactive conversation. The mobility of learners and the mobility of learning are creating new learning spaces and learning scenarios in the Higher Education landscape. The mobility of learners allows mobile technologies to be spontaneously integrated in the learning environment. Since learners use mobile technologies wherever they happen to be, they can learn what they need to, at any time via mobile technologies. Thus the integration of mobile technology in the learning environment is spontaneous, providing unlimited learning tasks, solving learning problems, submitting learning tasks electronically via mobile technologies, and offering specific choices for further learning. Students view learning strategies for mobile learning as being fun, providing great opportunities for them to multi-task while doing the required work.

Mobile technology is an informal or formal vehicle for complementing the learning process. Mobile technologies help students to obtain real-time information and real-time support. As a result, mobile technology puts the learning in the hand of the one who wants to learn. From the research evidence it appears that education technology is linked to other education management issues such as administration. To manage these technologies, the institutions have adopted a totally integrated approach when they are using mobile devices. However mobile technologies provide student services in and outside the university, particularly in rural areas.

Mobile technologies empower people to learn with available technologies in their hand, technologies that provide them with self-learning designs and just-in-time information wherever they are located. Mobile technologies, as an extension of e-learning, have empowered instructional designers to design web-based learning materials and learning environments that optimise student learning by accommodating various learner differences.

The challenges with conventional mobile technology help to position mobile learning as the most viable learning solution, because people use electronic devices in physical and virtual classrooms and this is where mobile learning integrates with e-learning. Mobile learning is a form of self-paced learning, because in some cases it is part of the formal curriculum - e.g. the lecturer who uses PDAs in the classroom. From the interview findings draw that mobile learning increases time on task, in that learners tend to spend more time with the content.

Mobile learning allows learners to access, search, solve, and transfer their learning via mobile technologies at anytime and anywhere, without having to wait for access to the university computer laboratory. However, there is a growing debate about the terms 'mobile learning', 'mobile teaching', and 'mobile instruction'. The essence of learning and teaching may be change when the medium changes, because particularly with mobile technologies, we are putting the learning in the hand of the one who wants to learn. This supports the idea of integration as learning with mobile technology can easily be blended into learners' daily lifestyles.

There is a potential for integrating the mobility of technology, learners and learning in terms of promoting outdoor learning. The mobility of technology integrated with the MXit chat room and the Internet on-the-go, provides an opportunity for informal learning outside the classroom. Parts of mobile learning activities take place outdoors, in the field.

The mobility of learning enables shifts between formal and informal learning to occur. Informal learning was previously merely incidental; now it is integrated with formal learning, for the possibility, flexibility and future priority of learning. Mobile technology provides learners with information they need, accessibility, playful engagement with learning tasks, and the possibility of integrating informal and formal learning. Integrating informal learning with formal learning that takes place in the classroom can add value and enhance the learning experience.

To answer the question as to how people use new mobile social mass media and the mobility of technology for learning and development, the findings indicate that mobile technologies can affect learning in terms of shifting between formal learning and informal learning. Further, the design of mobile mass media enables demonstrations, discussion forums and learning-by-doing exercises (immediate application).

Chapter 6

Conclusions and recommendations

6.1 Introduction

The purpose of this research is to explore the position of mobile learning in the context of learning and instructional design theories in the Higher Education landscape. However, mobile technologies are becoming mediated tools for teaching/learning purposes.

This thesis argues that multidisciplinary phenomena of mobility, learning, learner and mobile technological dynamics have spurred complex and conflicting discourses about mobile learning in the institutions of higher learning. Recurrent paradigm shifts and changes have had a visible impact on teaching and learning in Higher Education institutions. For example, mobility, technology, learners' location, learning spaces and institutional ideology have changed pedagogical and instructional design, teaching and learning, as well as learners' behaviour and mindsets.

The research was conducted according to the grounded theory approach as a 'data dance', with a zigzag way of collecting and analysing data. The methods of grounded theory are addressed in this study. The zigzag approach is simply advanced diagrams for describing, explaining, and writing in social research disciplines. It is inductively derived from the study of the phenomenon it represents. It discovers, develops and provisionally verifies through systematic data collection and analysis of data pertaining to that phenomenon (Charmaz, 2006). These research approaches enlightened the structure of the thesis chapters.

Chapter 1 is describing an overview of the structure of thesis, discussed the statement research problem, research questions, research objectives, constructing arguments, theoretical research perspective, significant and limitation of the study.

Chapter 2 analysed on learning and instructional design theory with case studies of mobile learning in the Higher Education context. It examined various available theories, principles and theorists. It facilitated an in-depth understanding of how theorists build a theory of learning and instructional design. The chapter presented a discussion of the research theory based on alternating concepts of technology, learning and instructional design. The chapter described how the learning and

instructional design theories echo and apply to mobile learning in the Higher Education context.

Chapter 3, an article first published in a of Educational Technology and Society journal and reproduced in this thesis, defined mobile learning, as “any type of learning that takes place in learning environments and spaces that take account of the mobility of technology, mobility of learners and mobility of learning” (El-Hussein & Cronjé, 2010:20). This definition was the main departure for categories working as a framework for collecting and analysing data from the field in a loop ‘data dance’ situation between the researcher and what was being researched.

Chapter 4 focused on the research design for this project. It examined the research methodology, approach, and methods for collecting and analysing data. The research design was based on qualitative grounded theory used in this context as an inductive approach to theory building. The chapter also analysed the relationship between the initial concepts, emergent themes and current theoretical approaches. These analyses provided a platform for developing categories and multiple frameworks for the theory of mobile learning. Grounded theory is relevant to the research purpose with its in-depth descriptions and understanding. The key idea was to communicate with people who are using mobile learning in order to derive a general explanation of how mobile devices satisfy academic objectives. I explained these processes and actions of teaching and learning with a focus on the learning theory of mobile learning and instructional design for learning spaces in the Higher Education landscape.

Chapter 5 presented the interview analysis. Five experts in the field of mobile learning were interviewed. Every interview covered the three sections of the conceptual model, namely mobility of technology, mobility of learner and mobility of learning, within the pedagogical dimensions.

6.2 Summary

This research problem takes into account the necessity of understanding the position of mobile and wireless technologies in Higher Education among learning and instructional design theories. The rapid development of learning activities and connectivity with wireless mobile devices and the day-by-day evolution of teaching/learning with technology mean that the concept of mobile education or mobile learning is still emerging and is therefore still unclear. The research problem centred on:

- The technology of mobile learning and its interactions with other learning media.
- Learning theory relevant to mobile learning.
- The position of mobile learning, handheld and wireless technologies in the Higher Education landscape.

To describe mobile learning, one has to postulate the numerous learning theories. Educators are not sure how learning takes place with mobile devices and if learning is actually taking place when learners are using mobile devices. How does learning take place when mobile devices are used as teaching and learning tools? This research focused on the learning theory of mobile learning and instructional design for learning spaces in the Higher Education landscape. I analysed the data from current literature as a way of understanding learning and instructional design theories as they relate to mobile learning. I compared practical learning with mobile devices with other learning media such as digital learning, which encompasses e-learning and distance learning.

The research problem centred attention on understanding mobile learning in terms of the learning and instructional design theories, namely, theories of education as associative (learning as activity), constructive (learning as achieving understanding) and situated (learning as a social practice) in the Higher Education landscape.

The rationale for this research was clarified by a number of changes of practice in Higher Education. These changes are: the change in learning and teaching practice and the non-existence of a theory of mobile learning in the Higher Education landscape. Discussion of literature on mobile learning devices sought to understand and embrace the changes in learners' location, teachers and institutions within the framework of ICT. Research into, and application of mobile learning "potentially brings the reward of placing institutions at the forefront of pedagogical practice, and addresses student requirements for flexibility and ubiquity, that is, 'anywhere, anytime, and with any device' learner engagement" (Cobcroft, Towers, Smith & Bruns, 2006:23).

Many changes are being observed in the field of technology in the era of digital activities that relate to learning theory and learners themselves, based on new social practices and changes relating to mobile devices. Therefore, the research used broad clusters of learning and instructional design theories. For these reasons the main research question asked:

How must theories be revised to interpret the change in the mobile learning context in the Higher Education landscape?

Sub-question 1: How does learning with mobile technologies differ from learning with other learning media and approaches?

Sub-question 2: What are the implications of mobile learning with regard to learning theory and instructional design theory?

Sub-question 3: How does the current pattern of learning with technology changing as a result of the introduction of mobile learning technology/learning in the Higher Education landscape?

6.3 Discussion

There is an expansion of the learning space in Higher Education such that the formal learning available at university campuses is not sufficient for the huge number of people who want to learn. The question arises as to how mobile technologies fit in with all these learning approaches and where do mobile technologies contribute to learning in Higher Education? It focuses attention on the interaction between mobile devices in social life (informal learning) and Higher Education (formal learning). Moreover, there is an interactivity of mobile learning with other learning approaches in Higher Education such as e-learning, conversational learning and distance learning. Mobile learning (m-learning) is learning with widely used devices that are available in most people's pockets or hands. The challenge facing mobile learning is the interaction of mobile devices with conversational ('face-to-face') learning, distance and e-learning, as 'blended' approaches. Most of the articles about mobile learning in academic journals describe research in terms of the practicalities of mobile learning (El-Hussein & Cronjé, 2010).

6.3.1 Methodological reflection

The research instruments were interviews, the literature and other documents such as journals and proceedings of conferences in education that focus on people using or planning to use mobile devices for teaching/learning purposes.

6.3.1.1 Literature and document reflection

To analyse the current literature I selected resources such as international academic journals in the field of educational technology. These journals were selected according to their 'impact factor' as the most published and cited journals in the field. Though there were several suitable journals in this literature analysis, I concentrated on two well known journals in the field of educational technology – The Journal of Educational Technology and Society, and The Journal of Educational Technology Research and Development.

The process of reading and critically analysing this literature was as follows:

- To locate the underlying assumption behind the research problem (paradigm; how the researcher sees the world).
- To review and critique previous research, methods and scholarly writing that relates to the research question and research discipline.
- To identify gaps in the literature.
- To refine and redefine the research questions further.

Most of the articles about mobile learning in academic journals described research in terms of the practicalities of mobile learning (El-Hussein & Cronjé, 2010). The criteria that I used to select journal articles and other texts for this study were simple: the extent to which the article or text succeeded in explaining and describing how mobile learning is growing in visibility and how it is acquiring an incremental importance in Higher Education practice throughout the developed world (Traxler, 2007).

The literature analysis started with a needs assessment that included the content and context of educational technology as it changed over time according to written reports. However, the analysis categorises and highlights the potential of innovation and includes multiple learning and instructional design theories for advancing the development of educational technology research. With respect to the two general concepts and processes – education and technology – I tried to find a connection between the instances of the educational theory concepts (theoretical clusters of current learning and instructional design theories, – theory) and those of the technology concepts (activities supported by technology – practice).

6.3.1.2 Interview reflection

I interviewed experts who use mobile devices in learning and teaching. These stakeholders are experienced individuals in the field of mobile learning. Interviews and experts participants benefited from theoretical claims in the sense of mobile learning, and educators were provided with an opportunity to apply the learning and instructional design theory that is relevant to mobile learning, particularly since I explained the objectives of the research study to my participants.

Based on the research conceptual framework, the interviews consisted of three parts: thinking aloud about mobility of technology, mobility of learners, and mobility of learning (El-Hussein, & Cronjé, 2010). I designed unstructured interviews and used them to obtain personal experience information from the expert participants. I investigated the natural context of mobile learning – at multiple locations and times – in order to facilitate learning by allowing easy explanations of mobile learning and technology that might be a usual part of those learning, teaching and design processes.

6.3.1.3 Analysis reflection

The data was analysed using the methods of thematic analysis, conceptual analysis of the literature on mobile learning, and instructional design theories interlaced with multidisciplinary data collection, coding and analysis. The data collection process dovetailed with the relevant theories of mobile learning. I analysed the data as a way of understanding learning theories and instructional design theories with respect to mobile learning. This approach sought to unlock these theories and identify the gaps where they relate to mobile learning, in order to understand the position of mobile learning in the Higher Education landscape.

In this study, “thematic analysis involves the search for and identification of common threads in the interview or set of interviews” (Morse & Field, 1995, Bowen, 2006:2). Of course, these themes are not easily identifiable. A theme may be present beneath the surface of an interview, but until identified, it is not obvious. Frequently, these themes are concepts indicated by the data rather than concrete entities described directly by the participants. Once identified, the theme reveals significant concepts that link substantial portions of the interviews together. Moreover, a variety of data sources may be tapped in a grounded theory study. As the researcher analyses the data, major themes are expected to emerge and are categorised in such a way that they can produce a theory (Bowen, 2006:2).

6.3.2 Substantive reflection

The article reproduced in Chapter 3 indicated that mobile learning is becoming a core pedagogical activity in institutions of Higher Education. Mobile learning has increased in terms of mobility of technology, mobility of learners and mobility of learning (El-Hussein & Cronjé, 2010). Researchers have defined mobile learning from different viewpoints. Mobile learning has one assumption; that learners can move continually with mobile devices, possibly with wireless connections. The article attempted to interpret the meaning of mobile learning in Higher Education by applying mobile concepts and characteristics to various elements of the mobile learning experience.

The literature shows that learning is moving from learning as a process to learning as an institutional phenomenon. Learning has acquired a social institutional meaning in terms such as 'the learning society', 'the learning organisation' and even 'lifelong learning'. Mobile learning resonates with learning and instructional design theories such as the associative, constructive and situated learning theories. The general critiques suggest that mobile learning has a tendency to change the learning location and part of the learning ideologies and educational philosophy.

The basic element of behaviourism, namely the 'stimulus and response' approach, sheds light on how a learner acquires learning and knowledge, and interacts associatively with learning activities and learning behaviours. Educators may use machines to enhance and support learning and possibly to use learners' mobile devices to enhance learning. Learning with mobile devices will not appear as measured behaviour. Therefore, associative theory does not seem to be an adequate theory to apply to mobile learning. Mobile technology might not drive stimulus-response conditions of learning as per previous claims that technology is driving mobile learning.

The constructive theory, as an individual approach, shows that mobile learning constitutes self-regulated learning. Experimentation or experiential learning is a typical constructive approach (Mayes & de Freitas, 2004b). Mobile learning social activities echo the theory of socialising, sharing and mediating mobile technologies and learning activities. The collaborative 'classroom' in the mobile learning environment provides opportunities for the social interaction of students. Theory of learning is limited in certain ways with regards to mobile learning. Media environments do not cause learning; cognitive processing by the learner causes learning in meta-cognitive and situated learning. Situated and situated cognition learning theories serve to view how learning occurs according to social paradigms.

Learning takes place as meaningful context rather than abstract learning in the classroom. Mobile technologies are suitable learning tools for outdoors and other locations that are subject to learners' movements.

It is through experience that learners learn and discover the world. The mobile-learning context, in the form of classroom structure, tools, and tasks, contributes to and influences the student's experience of learning.

6.3.3 Scientific reflection

The research process discusses research themes from the interviews and current literature on mobile learning as a part of e-learning. These arguments pay attention to learning and instructional design theories and participants or stakeholders in the research field. According to the research matrix, the research methods in this thesis refer to the research instruments, techniques and procedures that are aimed at collecting and analysing data from the field as a loop situation in order to answer the research questions.

Sub-question 1: What are the implications of mobile learning for Higher Education in the context of learning theory and instructional design theory?

This question underpinned the literature survey. To answer it, I collected data from the literature and other documents. I aimed to understand mobile learning in the context of learning and instructional design theories in Higher Education to clarify the theories that are applicable to mobile learning.

I compared practical learning with mobile devices with other learning media such as digital learning, which includes e-learning and distance learning. I also analysed the current practice of mobile learning and e-learning to identify relationships and differences. Interviews consisted of three parts: thinking aloud about mobility of technology, mobility of learners and mobility of learning.

Motivating learners in mobile learning environments is working, as technology 'pulls' the learners to carry out their learning tasks. However, although mobile technology pulls learning, learners use mobile technology spontaneously, individually and collaboratively. The students use mobile technology to create their learning environment and learning tasks. One of the reasons that students stay online and

learn is the technology itself. The integration of mobile technology in learning activities is spontaneous and a natural part of learners' lifestyles.

As the literature shows, learning is moving from learning as a process to learning as an institutional phenomenon. This obfuscates the understanding of terminologies related to educational technology or instructional technology with regards to mobile learning and its interaction with other teaching and learning characteristics.

The fundamental difference is that learning with computers in Higher Education is more formal learning, while learning with mobile technologies is more informal. New learning spaces are being created by mobility. Learners with digital, wireless technologies are transforming the learning environments and university campus lifestyles. In some cases, "e-learning simply becomes m-learning, without any particular change in content. Mobile learning is miniature but portable e-learning.

Research evidence of mobile learning evolution is overwhelming and shows the extent to which mobile devices are reshaping teaching and learning. The shift from e-learning to mobile learning (m-learning) is marked by the shift from computers to mobile devices. This resulted in an investigation which aimed to explore mobile learning concepts in an attempt to enhance the understanding of mobile learning. Academic institutions have therefore enhanced learning and teaching to support various type of learning in the light of modern learning and instructional design theories. The research that underlies the theory of mobile learning needs to be revised in the context of associative (learning as activity), constructive (learning as achieving understanding) and situated (learning as a social practice) learning.

What individual learning and collaborative role of mobility in terms of learning of stimulus–response condition for mobile learning context in Higher Education. This type of learning adopts a transmission model – learning takes place through the transmission of information from the tutor (the mobile learning system) to the learner. The connectionism theory was applied in early computer learning systems (and still is in mobile learning systems) that were designed based on a behaviourist approach to learning. This connection explains trial and error in mobile learning systems. Learning with mobile devices may not appear to be part of measured behaviour. The associative theory does not seem to be an adequate theory to apply to mobile learning.

The constructive theory as an individual approach shows that mobile learning postulates self-regulation learning. Mobile learning social activities echo the work of Vygotsky (1962 and 2000), with respect to socialising, sharing and mediating mobile technologies and learning activities. The collaborative classroom and outdoor learning in the mobile learning environment provide opportunities for the social interaction of students. "Media environments do not cause learning; cognitive processing by the learner causes learning" (Mayer, 2003). Learning with technology is not responsible for changing behaviours; learning is something that takes place in the learner's mind. Learning space and learning design have implemented computers in teaching, instruction and learning, while constructivism learning theory deals with the whole section of individual, co-operative and collaborative learning. This creates an environment for learning with computers.

Situated learning theories address how learning occurs according to social paradigms. "Work-based learning, continuing professional development, and apprenticeships are typical examples of situated learning (Siemens & Tittenberger, 2009:6-7). Educational research into situated learning points out the importance of giving learning a context (Lave & Wenger, 1991).

Mobile learning has increased awareness of mobility of technology and mobility of learners. Researchers have defined mobile learning from different viewpoints. Mobile learning as an educational activity makes sense only when the technology in use is fully mobile and when the users of the technology are also mobile while they learn Traxler (2007). In general, mobile learning can be viewed as any form of learning that happens through the mediation of mobile devices, and it is a form of learning that establishes the legitimacy of 'nomadic' learners. Mobile learning devices have also enriched the theory and practice of e-learning. The proper design of technologies leads to greater effectiveness of mobile learning.

Sub-question 2: How does learning with mobile technologies differ from learning with other learning media and approaches in Higher Education?

Sub-question 3: How does current pattern of learning with technology changing as a result of the introduction of mobile learning technology in the Higher Education landscape?

To find answers to these questions I conducted interviews with experts in the field of mobile learning. I aimed to compare learning with mobile devices to learning with

other learning media, in order to assess mobile learning and its interaction with other learning media and approaches. I described the current pattern of learning with mobile technology in order to evaluate learning with mobile technologies. Philosophical aspects contributed to the interpretive inquiry of consciousness and wisdom, which has implications for learning and teaching in future mobile learning. This aspect also drew upon learning theories regarding knowledge transfer and learning by discovery (Alessi & Trollip, 2001). Nomadic learners are very positive about mobile learning. Mobile technologies give a little bit of the responsibility back to the learner. In mobile learning they learn while they are having fun, they learn and they enjoy it, and that is stimulating and very positive. Mobile learning may mean learning whilst travelling, driving, sitting, or walking; it may be hands-free learning or eyes-free learning (Traxler, 2007).

6.3.3.1 Mobility of technology

Mobile technology provides learners with information that they need about their learning context. Integrating formal learning, in class, with informal learning adds value to formal learning. Informal learning must be integrated to enhance the learning experience. Mobile learning is self-paced learning because it is not part of the formal curriculum as yet. Mobile learning methods might increase the learning time spent on a task – a learner tends to spend more time with the content. The literature shows that there is the potential for mobile learning to promote outdoor learning as most mobile learning activities take place outdoors in the field. Mobile learning affects learning formally and informally.

Mobile learning technologies have created a system of signs of learning which embrace the transfer of learning materials between devices. The medium plays the role of mobilising learners, learning and instruction. Mobile learning means the use of mobile devices in the learning process. This indicates that learning stays the same whether it is face-to-face, e-learning or mobile learning. Mobile technologies are integrated as part of the whole learning activity.

The pedagogical approach takes into account finding suitable learning tasks, suitable technology and suitable learning environments. However, it creates challenges for students to learn with mobility of technology supporting learning. However, emerging mobile technologies and mobile learning concepts assume that mobile learning takes place anytime and everywhere. Mobile learning occurs in open areas, outside classrooms and lecture halls as informal learning.

Technology does not teach people; people still learn the context by using the technology. Teaching perhaps therefore adapted to incorporate mobile learning as a complementary learning tool. Mobile technology does attract learners and learning, however, learners use mobile technology spontaneously, both individually and collaboratively. The students use mobile technology to create their learning environment and learning tasks. There is no limit to learners learning with mobile technologies.

6.3.3.2 Mobility of learners

Mobile technologies give nomadic learners responsibility by involving them in mobile learning activities with continuous and sustainable processes. However, learners need to know how to learn with mobile technology.

Nomadic learners are very positive about mobile learning. Nomadic learners vary in their location, age, and level of education, and the availability of technology and the type of technologies available for learning activities differ greatly. Learning proliferates with digital mobile learning.

Universities expect mobile learners to learn with technology as they learn from a book, and as a result, learning with mobile technology will be a progressive, own language, interactive conversation. Mobility of learners and mobility of learning are creating new learning spaces and scenarios in the Higher Education landscape.

Mobility of learners integrates mobile technologies spontaneously in the learning environment. Learners use mobile technologies everywhere. Learners learn what they want to anytime via mobile technologies. Mobile learning provides unlimited learning tasks, and enables learners to solve problems, submit learning tasks electronically via mobile technologies, and make choices for further learning. Mobile learning provides the opportunity to multi-task while working.

Learners may be exposed to mobile learning in order to experience various learning methods and processes. Mobile technology is an informal vehicle for complimenting learning.

6.3.3.3 Mobility of learning

Mobile learning cannot be separated from e-learning; these tools are not different or isolated categories. Mobile learning and classroom learning are not, in a way, different at all. Learning remains, and the definition of learning remains, and new meanings are constructed.

Mobile learning facilitates learning by providing learning tasks that require the student to use available mobile technologies to solve problems.

Mobility of learning is shifting between formal and informal learning. In the past, informal learning was just incidental, but now informal learning is being integrated with formal learning, and the possibilities it opens up, and the flexibility it offers, make it a future priority. The use of informal learning strategies can enhance formal learning. Mobile technology provides learners with access to the information they need about their learning context, and facilitates playful engagements with learning tasks. Integrating formal learning, in class, with informal learning adds value. Informal learning must be integrated to enhance the learning experience.

6.4 Recommendations

Mobile learning as an educational activity makes sense only when the technology in use is fully mobile and when the users of the technology are also mobile while they learn (Traxler, 2007). These observations emphasise the mobility of learning and the significance of the term mobile learning. Mobile learning may be defined as wireless learning with digital devices and technologies that are generally produced for the public. A learner may then use them as he or she participates in Higher Education. Others define and conceptualise mobile learning by placing a strong emphasis on the mobility of learners and the mobility of learning, and the experiences of learners as they learn by means of mobile devices (El-Hussein & Cronje, 2010).

Learning with mobile technologies is not different from using any other technology for the purpose of learning. Mobile learning creates more flexible and more suitable circumstances and environments for student learning. It is the same principle as using technology-enhanced learning. It aims to enable students to learn by finding suitable technology that fulfils that specific need within the learning processes and the learning environment. The goal for mobile learning technology practitioners is to find the right tool for the right job in the learning environment. The desirable result is for technology to put learning in the hands of the ones who want to learn. In a way,

mobile learning and classroom learning are not different at all; learning remains, and the definition of learning remains, and the construction of new meanings remains.

The most important aspects of designing instruction in this context are identifying the technology and the learners, and creating learning material that makes use of mobile technology such as portable devices. It also involves identifying learners who are nomadic and able to understand and interpret learning materials. In general, mobile learning can be viewed as any form of learning that is mediated through mobile devices. It is a form of learning that establishes the legitimacy of nomadic learners.

6.4.1 Policy and practice

Mobile learning means the use of mobile devices in the learning process. The literature shows that although people use mobile devices for learning, the devices were not initially designed for instructional and learning purposes. The use of mobile technology depends on the context of the learner. Mobile learning is a part of e-learning and both of them are integral parts of technology in education. The act of learning with mobile technology stays the same at any level of intervention. However, the main difference between traditional classroom learning, e-learning and mobile learning is basically the mode of delivery. Essentially mobile learning is classroom learning that takes place out of the physical classroom. In e-learning the computer guides or sets the learning path in classroom or face-to-face interactions. The various methods may be integrated in such a way that no one realises that learning through mobile learning or learning through classroom learning differs – this can facilitate ubiquitous and spontaneous learning. Mobile learning and technology can be managed if institutions have certain (specific) technologies that they can lend to students. This approach has implications for learners (learning experience), teachers (practices), technology planning and sustainability. The aim of mobile technology and all other technologies is to help, to support, and to teach the students in context what they have to learn.

The overall advantage of mobile learning is that it is characterised by more flexible, more easily accessible and more personalised learning activities. Mobile learning devices have the capacity to enhance a learner's sense of individuality and community as well as his or her motivation to learn through participation in collaborative learning. Instructional theory in this mobile age mayhap is learner-centric rather than technology- or teacher-centric. Students using mobile technologies are not only remote from their instructors; they also fully control the access to information on their mobile devices. The challenges of conventional technology help

to position mobile learning as a most viable solution, because people use electronic devices in physical and virtual classrooms and this is where mobile learning integrates with e-learning. Mobile learning cannot be separated from e-learning; these tools are not different or isolated categories.

The pedagogical challenge is to find suitable learning tasks, suitable technology and suitable learning environments. Although there might be challenges facing students, a mobile device can be used to enhance the learning process, and to motivate the learner to make learning more interesting. Mobile learning occurs in open areas outside classrooms and lecture halls as informal learning. Universities willingly use mobile learning to support learners who share the information as well as the devices themselves. Technology does not teach people; people still learn in context by using technology. Mobile technologies are intended to support learning. Technology offers new interventions for learning tasks in fieldwork and outside classrooms.

What emerged from these discussions was that the goal of mobile learning is to facilitate learning, and the hope for the future is that learning can become ubiquitous with the aid of wireless convergence. Issues regarding the challenges facing mobile learning were addressed, including instructional strategies, learning content and design that promotes continuous modern learning activities. Learners may experience mobile learning in order to understand the learning process of that method. The purpose of the learning experience is for the learners to gain skills and knowledge and/or for there to be a change in attitudes and beliefs.

Mobile technologies empower people and enable them to learn with available technologies in their hands – technologies that provide learners and students with self-learning and 'just-in-time' information, wherever they are located. Technologies have enabled web-based instructional designers to design learning materials/environments that optimise learning by accommodating various learner differences (Hsu, Lin, Ching & Dwyer, 2009:272).

6.4.2 Further research

The findings of this research are that mobile learning is not about mobile technology; mobile learning is about the nomadic learner and the mobility of learning. Mobile technology is simply a means of providing more flexibility and greater mobility and is not the key instrument in the learning process. It is the medium for delivery of instruction and it supports learning. Mobile learning technologies have created a system of signs of learning with mobile technologies which embrace the transfer of

learning materials between devices, with the medium playing a role in mobilising learning and instruction.

This complicates the understanding of terminologies related to educational technology or instructional technology and of mobile learning and its interaction with other teaching and learning concepts. In the mobile learning context, the learning process slowly makes its way out of the classrooms. Technology advancement has led to new trends in learning and education both in real life and virtually. This has resulted in the birth of a new term – mobile learning. In a study of these trends, mobile learning is well positioned to champion these innovations.

All these issues create new learning spaces for Higher Education. The difficulty of envisioning challenging scenarios and promoting innovation that exploits emerging technologies is not specific to mobile learning. Mobile learning makes a clear link between the building of daily life, learning social lifestyles, tools and learners and learning attitudes toward increasing up in crucial needs for a different kind of educational experience that is surrounded in the relationship between people and their environment in specific research continents and context.

The literature shows that there is the potential for mobile learning to promote indoor and outdoor learning. This marriage of technologies led to investigate how mobile devices could be used to engage people in outdoor learning. Emergent new interpretations of learning and instructional design theories and practical learning methods open new horizons and opportunities for people to learn with mobile technologies.

The literature on mobile technology shows that mobile learning is becoming more attractive, while e-learning may already be losing favour. The evidence of an upcoming era of mobile learning is overwhelming and mobile learning is starting to take hold. It might dominate future learning processes. The shift from e-learning to m-learning is marked by the shift from computers to mobile devices. Mobile learning is related to portable, fashionable, social lifestyles.

There is a need for high quality teaching and learning for increasing numbers of people. These issues will encourage innovation in many aspects of learning systems, methodologies and approaches in the form of distance learning, electronic learning and mobile learning.

It is very difficult to keep up to date with mobile learning as new technologies are available continually. The challenge is to find the technology that is suitable for fulfilling the specific need within the learning environment.

Designers and practitioners in education are therefore responsible for producing coherent and reliable accounts of the proliferation of mobile devices in the Higher Education landscape. The proper use of technology leads to greater effectiveness of mobile learning. Such accounts may possibly consider the multiplicity of meanings that are implied by the mobility of educational delivery and the mobility of learners. It is also necessary to describe in detail the various advantages and disadvantages of mobile instructional devices as tools for the delivery of Higher Education.

Philosophers and theorists of education perhaps explain the philosophical and theoretical assumptions applicable to mobile learning in Higher Education. They may also clarify the design paradigm shifts that this mode of education has introduced in practice.

6.4.3 Further developments

Mobile learning devices have enriched the theory and practice of e-learning. Participants in contemporary Higher Education in developing countries almost always use mobile learning devices as adjuncts to e-learning. The use of mobile computing together with e-learning provides access to resources wherever you are: strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment (Ally, 2005).

This resulted in an investigation, which sought to clarify mobile learning concepts and to enhance the understanding of mobile learning.

The literature indicates that there has been a development from traditional classroom learning to distance learning, e-learning and mobile learning. However, the growth of educational technology has changed the teaching and learning processes significantly. This development provides space to search and ask about future learning, e-learning and mobile learning. This conceptualisation of mobile learning in terms of learners' experience emphasises mobility, ownership, informality and a context that can always be inaccessible to conversational 'tethered' e-learning (Traxler, 2007).

REFERENCES

- Albirini, A. 2007. The crisis of educational technology, and the prospect of reinventing education. *Educational Technology & Society*, 10(1):227-236, January.
- Alessi, S. M., & Trollip, S. R. 2001. *Multimedia for learning: methods and development*. 3rd ed. Massachusettes, USA: Allyn & Bacon.
- Alexander, B. 2004. Going nomadic: mobile learning in higher education. *EDUCAUSE Review*, 5(35):29-35, September-October.
- Allan, G. 2003. A critique of using grounded theory as a research method. *The Electronic Journal of Business Research Methods*, 2(1):1-10, July.
- Ally, M. 2005. Using learning theories to design instruction for mobile learning devices. In Attewell, J. & Savill-Smith, C. (eds). *Mobile learning: anytime everywhere*. London, UK: Learning and Skills Development Agency. 5-8
- Ally, M. 2008. Foundations of educational theory for online learning. In Anderson, T. (ed). *The theory and practice of online learning*. 2nd ed. Athabasca, Canada: AU Press: Athabasca University: 15-44.
- Ally, M. 2009. Introduction. In Ally, M. (ed). *Mobile learning: transforming the delivery of education and training*. Edmonton, Canada: AU Press: Athabasca University: 1-6.
- Amiel, T. & Reeves, T.C. 2008. Design-based research and educational technology: rethinking technology and the research agenda. *Educational Technology & Society*, 11(4):29-40, October.
- Anastopoulou, S., Sharples, M., Wright, M., Martin, H., Ainsworth, S., Benford, S., Crook, C., Greenhalgh, C. & Ainsworth, S. 2008. Learning 21st century science in context with mobile technologies. In Traxler, J. R. (ed). *Proceedings of the mLearn 2008 Conference: the bridge from text to context*. 2008. Wolverhampton, UK: School of Computing and Information Technology, University of Wolverhampton:12-19.
- Anthony, G. 1996. Active learning in a constructivist framework. *Educational Studies in Mathematics*, 4(31):349-369, October.
- Ashworth, P. (2003). The origins of qualitative psychology . In J. A. Smith (Ed.), *Qualitative psychology: a practical guide to research methods* (pp. 4-24). London, UK: Sage publications Ltd.
- Attewell, J. & Savill-Smith, C. 2005. *Mobile learning anytime everywhere: a book of paper from Mlearn 2004*. London, UK: Learning and Skills Development Agency.
- Attewell, J. 2005. From research and development to mobile learning: tools for education and training providers and their learners. *Proceedings of mLearn 2005*. <http://www.mlearn.org.za/CD/papers/Attewell.pdf> [Accessed 15 August 2009]
- Banks, K. 2008. Mobile learning in developing countries: present realities and future possibilities. In Hirtz, S. (ed). *Education for a digital world: advice, guidelines, and effective practice from around the globe*. Commonwealth of

Learning: 51-56.

Beale, R. 2007. How to enhance the experience without interfering with it. In Sharples, M. (ed.). *Big issue in mobile learning: a report of a new workshop by the Kaleidoscope network of excellence mobile learning initiative*. London, UK: Learning Science and Research Institution: University of Nottingham: 12-16.

Berry, M. 2003. Professional development issues in technology education: the changing scenery. In Martin, G. (ed). *Initiatives in technology education: comparative perspectives*. Gold Coast, Australia: Technical Foundation of America and the Centre for Technology Education Research Griffith University: 286-297.

Bird, P. & Stubbs, M. 2008. A Bridge too far? – Embedding Mobile Learning in UK Higher Education. In Traxler, J. R. (ed). *Proceedings of the mLearn2008 conference: the bridge from text to context. 7th-10th October 2008*. Wolverhampton: The University of Wolverhampton: School of computing and Information Technology: 36-43.

Blignaut, A. S. & Trollip, S. R. 2003. Developing a taxonomy of faculty participation in asynchronous learning environments – an exploratory investigation. *Computers & Education*, 2(41):149-172, September.

Boeree, G. C. 2000. *The ancient Greeks, Part Two: Socrates, Plato and Aristotle*. <http://webpace.ship.edu/cgboer/athenians.html> [Accessed 15 May 2009].

Boote, D., A., & Beile, P. 2005. Scholars before researchers: on the centrality of the dissertation literature review in research preparation. *Educational Researcher*, 34(6):3-15, August-September.

Botha, A. T., Traxler, J. & Ford, M. 2008. MobilED: a tool by any other name. In Traxler, J. R. (ed). *Proceedings of the mLearn 2008 conference: the bridge from text to context. 7th-10th October 2008*. Wolverhampton, UK: School of Computing and Information Technology: University of Wolverhampton: 44-50.

Botha, A., Vosloo, S., Kuner, J., & van den Berg, M. 2008. Improving cross-cultural awareness and communication through Mobile Technologies. In Traxler, J. R. (ed). *Proceedings of the mLearn 2008 Conference: the bridge from text to context. 7th-10th October 2008*. Wolverhampton, UK: School of Computing and Information Technology, University of Wolverhampton: 58-65.

Bowen, G. A. 2006. Grounded theory and sensitizing concepts. *International Journal of Qualitative Methods*, 5(3):12-23, July.

Broos, E. & Cronjé, J. C. 2009. Information society needs of managers in a large governmental organisation. *Educational Technology & Society*, 1(12):285-297, January.

Brown, T. H. 2006. Beyond constructivism: Navigationism in the knowledge era. *On the Horizon*, 14:(3), Emerald Group Publishing limited, Bradford, UK. 1-14.

Burbules, N. C. 2000. A half-century of educational theory: prespectives on the past, present and future. *Educational Theory*, 50(3):279-288, Summer.

Burrell, G. & Morgan, G. 1979. Sociological paradigms and organizational

analysis. London, UK: Heinemann.

Caffarella, R.S. and Merriam, S.B. (1999), *Learning in Adulthood: A Comprehensive Guide*, 2nd ed., Jossey-Bass Publishers, San Francisco, CA.

Castles, S & Davidson, A. 2000. *Citizenship and migration: globalization and the politics of belonging*. Houndmills: Macmillan Press.

Castles, S. 2000. *Ethnicity and globalization*. London: SagePublications.

Charmaz, C. 2000. Grounded theory: objectivist and constructivist methods. In Denzin, N. K. and Lincoln, Y. S. (ed). *Handbook of qualitative research*. 2nd ed. Thousand Oaks: Sage: London, UK. 509-535.

Charmaz, K. 2006. *Constructing grounded theory: practical guide through qualitative analysis*. California, USA: Sage Publications Ltd.

Chen, N. S. & Tsai, C. C. 2009. Knowledge infrastructure of the future: guest editorial. *Educational Technology & Society*, 1(12):1-4, January.

Cobcroft, R. 2006. *Literature review into mobile learning in the university context*. Queensland University of Technology, Creative Industries Faculty. Creative Commons Attribution.

Cobcroft, R., Towers, S., Smith, J. & Bruns, A. 2006. Mobile learning in review: opportunities and challenges for learners, teachers, and institutions. *Proceedings online learning and teaching (OLT) Conference. 02/11/2006:21-30*. Brisbane: Queensland University of Technology .

Colley, J. & Stead, G. 2004. Take a bite: producing accessible learning materials for mobile devices. *Proceedings of mLearn 2003: Learning with Mobile Devices*. 43-46. London, UK: Learning and Skills Development Agency.

Creswell, J. W. 2007. *Qualitative inquiry and research design: choosing among five approaches*. 2nd ed. California, USA: Sage Publication Inc.

Cronjé, J. C. 2007. Who killed e-learning?
Instructional Technology Forum
<http://it.coe.uga.edu/itforum/Cronje101/Who%20killed%20e-learning.pdf>
[Accessed 23 June 2010].

Cronjé, J., Adendorff, D. E., Meyer, S. M., & van Ryneveld, L. 2006. Surviving the shipwreck: what makes online students stay online and learn? *Educational Technology & Society*, 4(9):185-193, October.

Delich, P., Kelly, K. & McIntosh, D. 2008. Emerging Technologies in E-learning. In Harper, D. H. (ed). *Education for a Digital World: Advice, Guidelines, and Effective Practice from Around the Globe*. Vancouver, Canada: BC campus and Commonwealth of Learning: 5-22.

Denison, D. R. 1996. What is the difference between organizational culture and organizational climate? A native's point of view on a decade of paradigm wars . *Academy of Management Review*, 21(3):619-654, July.

Derrida, J. 2006. *Writing and difference*. Bass, A. (trans). London, UK: Routledge.

Dewey, J. 1916. *Democracy and education: an introduction to the philosophy of education*. USA: The Macmillan Company.

Divitini, M., & Morken, E. 2007. Collaborative community-oriented mobile learning: a position statement. In Arnedillo-Sánchez, I. S. (ed). *Beyond mobile learning workshop*. Trinity College Dublin Press in Association with Environmental Publications with Sponsoship by Kaleidoscope: 12-15.

Doty, D., H., & Glick, W., H. 1994. Typologies as a unique form of theory building: towards improved understanding and modeling. *The Academy of Management Review*, 19(2):230-251, April.

Driscoll, M. 1994. *Psychology of learning for instruction*. Toronto, Canada: Allyn & Bacon.

Dron, J. 2007. Designing the undesignable: social software and control. *Educational Technology & Society*, 3(10):60-71, July.

Drummond, S. 2008. Digital mini film festival: a framework for mobile learning. In Traxler, J. R. (ed.), *Proceedings of the MLearn 2008 conference: the bridge from text to context*. Ironbridge Gorge, Shropshire: School of Computing and Information Technology, University of Wolverhampton: 129-136.

Dubin, R. 1969. *Theory Building*. New York, USA: Collier-Macmillan Limited, London.

El-Hussein, M. O. M., & Cronjé, J. C. 2010. Defining mobile learning in the higher education landscape. *Educational Technology & Society*, 13(3):12-21, July.

Engeström, Y. 1987. *Learning by expanding: an activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit.

Engeström, Y. 2001. Expansive learning at work: toward an activity theoretical reconceptualization. *Journal of Education and Work*, 14(1):133-156, January.

Foucault, M. 1989. *The Archaeology of knowledge*. Sheridan Smith, A. M. (trans). UK: Routledge: Taylor & Francis Group.

Fullan, M. 2007. *The new meaning of educational change*. 7th ed. USA: Teachers College Press.

Gagné, R. M. 1985. *The condition of learning and theory of instruction*. 3rd ed. USA: Robert Woodbury.

Gioia, D., A. & Pitre, E. 1990. Multiparadigm perspectives on theory building. *The Academy of Management Review*, 15(4):584-602, October.

Glaser 1992. *Basic of grounded theory analysis*. Mill Valley. CA: The Sociology Press.

Glaser, B. G. & Strauss, A. L. 1967. *The discovery of grounded theory: strategies for qualitative research*. New York, USA: Aldine.

Goktas, Y., Yildirim, S. & Yildirim, Z. 2009. Main barriers and possible enablers of ICTs integration into pre-service teacher education programs.

Educational Technology & Society, 1(12):193-204, January.

Good, T. L. & Brophy, J. E. 1990. *Educational psychology: a realistic approach*. White Plains, NY: Longman.

Guralnich, D. 2008. The Importance of the Learner's Environmental Context in the Design of M-Learning Product1. *International Journal of Interactive Mobile Technologies*2, 2(1):36-39.

Hannafin, M. J. & Peck, K. L. 1988. *The design, development, and evaluation of instructional software*. New York, New York: Macmillan.

Hanseth, O. & Lyytinen, K. 2010. Design theory for dynamic complexity in information infrastructures: the case of building internet. *Journal of Information Technology*. 25(1):1-19, March.

Holzinger, A., Nischelwitz, A. & Meisenberge, M. 2005. Mobile phones as a challenge for m-Learning: examples for mobile interactive learning objects (MILOs). *Proceedings of the 3rd International Conference on Pervasive Computing and Communications Workshops (PerCom 2005 Workshops)*. IEEE. 1-6.

Hoppe, U. 2007. How can we integrate mobile devices with broader educational scenarios. In Sharples, M. (ed). *Big issues in mobile learning: a report of a new workshop by the Kaleidoscope network of excellence mobile Learning initiative*. London, UK: Learning Science and Research Institution: University of Nottingham:32-35.

Howell, B., & Obren, M. 2003. *Telecommunications usage in New Zealand: 1993-2003*. Wellington, New Zealand: New Zealand Institution for the Study of Competition and Regulation Inc.

Hsu, Y. C., Lin, H., Ching, Y. H. & Dwyer, F. M. 2009. The effects of web-based instruction navigation modes on undergraduates' learning outcomes. *Educational Technology & Society*, 1(12):271-284, January.

Huang, Y. M., Huang, T. C. & Hsieh, M. Y. 2008. Using annotation services in a ubiquitous jigsaw cooperative learning. *Educational Technology & Society*, 11(2):3-15, April.

Huang, Y. M., Jeng, Y. L. & Huang, T. C. 2009. An educational mobile blogging system for supporting collaborative learning. *Educational Technology & Society*, 12(2):163-175, January.

Hughes, L. 2008. Wild Knowledge: a review of using mobile technology to promote outdoor learning. In Traxler, J. R. (ed). *Proceedings of the mLearn 2008 conference: the bridge from text to context*. Wolverhampton, UK: School of Computing and Information Technology, University of Wolverhampton: 341.

Järvelä, S., Näykki, P., Laru, J. & Luokkanen, T. 2007. Structuring and regulating collaborative learning in higher education. *Educational Technology & Society*, 10(4):71-79, October.

Jarvis, P., Holford, J. & Griffin, C. 2003. *The theory and practice of learning*. 2nd ed. London, UK: Kogan Page Limited.

Jonas, H. 1979. *Toward a philosophy of technology*. The Hastings Center

Report.

Jonassen, D. H. 1991. Objectivism versus constructivism: do we need a new philosophical paradigm? *Educational Technology Research and Development*, 39(3):5-14, September.

Jonassen, D. H. 1994. Technology as cognitive tools: learners as designers. *Instructional Technology Forum*.
<http://itech1.coe.uga.edu/itforum/paper1/paper1.html>
[Accessed 12 May 2009].

Jonassen, D. H. 1996. *Computers in the classroom: mindtools for critical thinking*. New Jersey: Merrill: an Imprint of Prentice Hall.

Jones, A., Issroff, K. & Scanlon, E. 2007. Affective factors in learning with mobile devices. In Sharples, M. (ed). *Big issues in mobile learning: a report of a workshop by the Kaleidoscope network of excellence mobile learning initiative*. Nottingham, UK: Learning Sciences Research Institute: University of Nottingham: 17-22.

Jovanović, J., Gašević, D., Knight, C. & Richards, G. 2007. Ontologies for effective use of context in e-Learning settings. *Educational Technology & Society*, 10(3):47-59, July.

Karagiorgi, Y. & Symeou, L. 2005. Translating constructivism into instructional design: potential and limitations. *Educational Technology & Society*, 8(1):17-27, January.

Katz, E. & Liebes, T. 2007. No more peace!: how disaster, terror and war have upstaged media events. *International Journal of Communication*, 1:157-166, January.

Keegan, D. 2002. *The future of learning: from elearning mlearning*. Redaktion: Herausgegeben von Hulmut Fritsch.

Kelsey, K. 2003. Grounded theory designs.
<http://www.okstate.edu/ag/agedcm4h/academic/aged5980/power/598314.ppt>
[Accessed 20 April 2010].

Kenny, R. F. & Van Neste-Kenny, J. C. 2009. Using mobile learning to enhance the quality of nursing practice education. In Ally, M. (ed). *Mobile learning: transforming the delivery of education and training*. Athabasca, Canada: AU Press, Athabasca University: 76-98.

King, P. J. 2006. *One hundred philosophers: a guide to the world's greatest thinkers*. London, UK: Quarto Publishing plc.

Kolb, D. 1984. *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Koole, M. L. 2009. A model for framing mobile learning. In Ally, M. (ed). *Mobile learning: transforming the delivery of education and training*. Athabasca, Canada: AU Press, Athabasca University: 25-47.

Krauss, S. E. 2005. Research paradigms and meaning making: a primer. *The Qualitative Report*, 10(4):758-770, December.

Kravicik M., Kaibel, A., Specht, M. & Terrenghi, L. 2004. Mobile collector for field trips. *Educational Technology & Society*, 2(7):25-33, April.

Kukulska-Hulme, A. & Traxler, J. 2005a. *Mobile learning: a handbook for educators and trainers*. USA: Taylor & Francis.

Kukulska-Hulme, A. & Traxler, J. 2005b. Mobile teaching and learning. In Kukulska-Hulme, A. & Traxler, J. (eds.), *Mobile learning: a handbook for educators and trainers*. London, UK: Routledge: Taylor & Francis Group: 25-44.

Kukulska-Hulme, A. 2007. Mobile usability in educational contexts: what have we learnt? *The International Review of Research in Open and Distance Learning*, 8(2):01-20, June.

Laouris, Y. & Eteokleous, N. 2005. *We need an educationally relevant definition of mobile learning*.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.106.9650&rep=rep1&type=pdf>
[Accessed 12 October 2007].

Lave, J., & Wenger, E. 1991. *Situated learning: legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lythcott, J., & Duschl, R. 1990. Qualitative research: from methods to conclusions. *Science Education*, 74(4):445-460, August, 22.

Martin, A. & Madigan, D. (eds.). 2006. *Digital literacies for learning*. London: Facet Publishing.

Mayer, R. E. 2003. The promise of multimedia learning: using the same instructional design methods across different media. *Learning and Instruction*. 13(2):125-139, April.

Mayes, T. & de Freitas, S. 2004a. Innovative e-Learning with mobile and wireless technologies. *Three approaches to understanding how people learn*.

Mayes, T. & de Freitas, S. 2004b. *Stage 2: review of e-learning theories, framework and models*. JISC. JISC E-learning Models Desk Study.

McMillan, J. H. & Schumacher, S. 2001. *Research in education: a conceptual introduction*. 5th ed. New York, USA: Priscilla McGeehon.

Mergel, B. (1998, May). *Instructional design and learning theory*.
<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.135.5780&rep=rep1&type=pdf>
[Accessed 20 May 2010].

Milrad, M. & Spikol, D. 2007. Anytime, anywhere learning supported by smart phones: experiences and results from the MUSIS project. *Educational Technology & Society*, 4(10):62-70, October.

Morse, J. M. & Field, P. A. 1995. *Qualitative research methods for health professionals*. Thousand Oaks, CA: Sage.

Motiwalla, L. 2007. Mobile learning: a framework and evaluation. *Journal of Computer and Education*, 49(3):581-596, November, 20.

Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. 2004. NESTA Futurelab Report 11: Literature Review in Mobile Technologies and Learning. Bristol, UK:NESTA Futurelab. {27 December 2009}
http://www.nestafuturelab.org/research/reviews/reviews_11_and12/11_01.htm

Nieuwenhuis, J. 2007a. Qualitative research designs and data gathering techniques. In Maree, K. (ed). *First steps in research*. Pretoria, South Africa: Van Schaik Publishers: 70-97.

Nieuwenhuis, J. 2007b. Analysing qualitative data. In Maree, K. (ed.), *First steps in research*. Pretoria, South Africa: Van Schaik Publishers: 99-122.

Norris, C. Shin, N. & Soloway, E. 2007. Technology for the Mainstream: A Call for Designing for Simplicity and Reliability. *Educational Technology: the Magazing for Mangers of Changes in Education*, XLVII(3). 6-9. June-July.

Nyíri, K. 2002. Towards a philosophy of m-learning. *Proceedings IEEE international workshop on wireless and mobile technologies in education*. Växjö, Sweden. 2002:121-124.

Papert, S. 1980. *Mindstorms: children, computers, and powerful ideas*. Brighton, Sussex, UK: John Spiers and Margaret, A. Boden.

Pavlova, M. 2003. Questioning the nature of technology education within the context of social change. In Martin, G. (ed). *Intitatives in technology education: comparative perspectives*. Gold Coast, Australia: Technical Foundation of America and the Centre for Technology Education Research, Griffith University: 46-59.

Percival, F. & Ellington, H. 1984. *A handbook of educational technology*. New York, USA: Nichols Publishing Company.

Pham-Nguyen, C., Lau, B. & Barby, B. 2008. Pervasive learning system based on a scenario model integrating web service retrieval and orchestration. In Traxler, J. R. (ed.). *Proceedings of the mLearn 2008 conference: the bridge from text to context*. Wolverhampton, UK: School of Computing and Information Technology, University of Wolverhampton: 240-247.

Pineteh, E. 2010: Using virtual interactions to teach communication skills to Information technology Students. *International Conference of Education, Research and Innovation Proceedings*. Madrid, Spain: 15-17 November 2010. (ISBN: 978-84-614-2439-9, www.iceri2010.org).

Quist-Adade, C. 2008. Challenges confronted and lessons (un)learned: linking students from the University of Ghana and Kwantlen University College. In Harper, D. H. (ed.), *Education for a Digital World: Advice, Guidelines, and Effective Practice from Around the Globe*. Vancouver, Canada: BCcampus and Commonwealth of Learning: 31-40.

Ramli, A., Ismail, I. & Idrus, R. 2010. Mobile learning via SMS among distance learners: does learning transfer occur? *International Journal of Interactive Mobile Technologies*, 4(3):30-35, July.

Ramsden, A. 2008. How do people use twitter and why do we need to know? In Traxler, J. R. (ed). *Proceedings of the mLearn 2008 conference: the bridge from text to context*. Wolverhampton, UK: School of Computing and

Information Technology, University of Wolverhampton: 358.

Reigeluth, C. M. 1996. A new paradigm of ISD? *Educational Technology*, 3(36):13-20.

Reigeluth, C. M. 1999b. What is Instructional design theory and how is it changing? In Reigeluth, C. M. (ed.). *Instructional design theories and models: a new paradigm of instructional theory*. 2nd Vol. Mahwah, USA: Lawrence Erlbaum Associates: 5-29.

René, C. & Gabriel, L. 2010. A framework for educational collaborative activities based on mobile devices: a support to the instructional design. *International Journal of Interactive Mobile Technologies*, 4(3):9-18, July.

Roode, D. 2008. The ethical researcher. *South African Computer Journal*, 41:38-42, December.

Saha, S., Saint, S. & Christakis, D. 2003. Impact factor: a valid measure of journal quality? *Journal of the Medical Library Association*, 1(91):42-46, January.

Scardamalia, M. & Bereite, C. 2006. Knowledge building: theory, pedagogy, and technology. In Sawyer, K. (ed). *Cambridge Handbook of the Learning Sciences*. New York, USA: Cambridge University Press. 97-118.

Sears, A. & Hughes, A. 2006. Citizenship: education or indoctrination? *Journal of the Society for the History of Education*, 2(1):01-17, July.

Seligman, M., E. & Csikszentmihalyi, M. 2000. Positive psychology: an introduction. *American Psychologist*, 55(1):5-14, January.

Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers & Education*, 34(3-4):177-193.

Sharples, M., Corlett, D. & Westmancott, O. (2002). The design and implementation of a mobile learning resource. *Personal and Ubiquitous Computing*, 6(3):219-234.

Sharples, M., Taylor, J. & Vavoula, G. 2007. A theory of learning for the mobile age. In Andrews, R. (ed). *The Sage handbook of e-learning research*. London, UK: Sage. 47-221.

Siemens, G., & Tittenberger, P. 2009, March. *Handbook of emerging technologies for learning*. Manitoba.
http://umanitoba.ca/learning_technologies/cetl/HETL.pdf
[Accessed 20 May 2010].

Skinner, B. (1958 24 October). *Teaching machines*.
www.bf Skinner.org/BFSkinner/Articles_files/teaching_machines.pdf
[Accessed 2 May 2008].

Smith, M. K. 1999. *Learning theory*.
The Encyclopedia of Informal Education:
www.infed.org/biblio/b-learn.html
[Accessed 20 October 2009].

Snowden, D. 2002. Complex acts of knowing: paradox and descriptive self-

awareness. *Journal of Knowledge Management*, 6(2):100 – 111.

Soysal, Y. 1994. *Limits of citizenship: migrants and postnational membership in Europe*. Chicago: Chicago University Press.

Strauss, A. & Corbin, J. 1990. *Basic of qualitative research: techniques and procedures for developing grounded theory*. 2nd ed. Thousand Oakas, USA: Sage Publications Inc.

Strauss, A. & Corbin, J. 1998. *Basics of qualitativer research: grounded theory produers and tichniques*. 2nd ed. Thousand Oakas. CA: Sage.

Strömbäck, J., Shehata, A. & Dimitrova, D. 2008. Framing the Mohammad cartoons issue: a cross-cultural comparison of Swedish and US Press. *Global Media and Communication*, 2(4):117-138, August.

Suddaby, R. 2006. From the editors: what grounded theory is not. *Academy of Management Journal*, 49(4):633-642, August.

Sutton,, R. I. & Staw, B. M. 1995. What theory is not. *Administrative Science Quarterly*, 40(3):317-384, September.

Thomas, S. 2005. Pervasive, persuasive e-Learning: modeling the pervasive learning space. *Proceedings of the 3rd international conference on pervasive computing and communications workshops (PERCOMW'05)*. 2005:332-336. Kauai Island: Hawaii: IEEE Computer Society.

Thorndike, E. L. (1998). Animal Intelligence: an Experimental Study of the Associate Processes in Animals. *American Psychologist*. 53(10): 1125 1127, October.

Thorndike, E. L. 1908. The effect of practice in the case of a purely intellectual function . *The American Journal of Psychology*, 19(3):374-384, July.

Ting, Y. R. 2005. Mobile learning: current trends and future challenges. *Proceedings of the 5th International Conference on Advanced Learning Technologies*, Los Alamitos, CA: IEEE Computer Society Press.

Traxler, J. 2007. Defining, discussing and evaluating mobile learning: the moving finger writes and having writ... *The International Review in Open and Distance Learning*, 8(2):01-13, June.

Traxler, J. 2009. Current state of mobile learning. In Ally, M. (ed.), *Mobile learning: transforming the delivery of education and training*. 2009:9-24. Athabasca, Canada: AU Press, Athabasca University.

Trinder, J. 2005. Mobile technologies and systems. In Kukulska-Hulme, A. & Traxler, J. R. (ed). *Mobile learning: a handbook for educators and trainers*. New York, USA: Routledge: Taylor & Fracis Group.

Trochim, W. M. 2001. *The research methods knowledge base*. 2nd ed. Cincinnati, USA: Atomic Dog Publishing.

Tsai, M. J. 2009. The model of strategic e-Learning: understanding and evaluating student e-Learning from metacognitive perspectives. *Educational Technology & Society*, 12(1):34-48, January.

- Uden, L. 2007. Activity theory for designing mobile learning. *Journal of Mobile Learning and Organisation*, 1(1):81-102, January.
- Van Dijk, T. A. 1993. Principles of discourse analysis. *Discourse & Society*, 4(2):249-283, Fall.
- Van Hoof, M. & Vahey, P. 2007. Introduction to special issue on highly mobile computing. *Educational Technology: the Magazine for Manager of Change in Education*, 3(74), 3-5.
- Violas, P. C. 1971. The indoctrination debate and the great depression. *The History Teacher*, 4(4):25-35, Fall.
- Vithal, R. & Jansen, J. 1997. *Designing your first research proposal: a manual for researchers in education and the social science*. Pretoria, SA: Juta & Co Ltd.
- Vygotsky, L. 1978. *Mind in society*. Cambridge, MA: Harvard University Press.
- Vygotsky, L. S. (2000). *Educational Psychology* 2nd ed. Silverman, R. (trans.) Boca Raton, Florida, USA: CRC Press LLC.
- Vygotsky, L. S. 1962. *Thought and language*. 4th ed. Hanfmann, E. D. (trans). Cambridge, Massachusetts, USA: E. The M.I.T. Press.
- Walker, K. 2007. Introduction: mapping the landscape of mobile learning. In Sharpless, M. (ed). *Big issues in mobile learning*. Nottingham, UK: University of Nottingham. 5-6.
- Waston, J. B. 1913. Psychology as the behaviorist views it. In Green, C. D. (ed). *Classics in the history of psychology*. York, Canada: Psychological Review: 158-177.
- Wehmeier, S. M. (Ed.). 2005. *Oxford Advanced Learner's Dictionary*. 7th ed. Oxford, USA: Oxford University Press.
- Weiser, M. 1993. Some computer science issues in ubiquitous computing. *Communications of the ACM*, 36(7):75-84. July.
- Wenger, E. 1999. *Communities of practice: learning, meaning and identity*. Cambridge, United Kingdom: Cambridge University Press.
- Wenger, E. 2006, June. *Communities of practice: a brief introduction*. Etienne Wenger: Home Page: <http://www.ewenger.com/theory/index.htm> [Accessed 12 May 2010].
- Williams, P. J. 2003. Technology education in Australia: a status report. In Martin G. (ed.), *Initiatives in technology education: comparative perspectives*. Gold Coast, Australia: Technical Foundation of America and the Centre for Technology Education Research: 1-15.
- Winters, N. 2007. What is mobile learning? In Sharpless, M. (ed). *Big issues in mobile learning: a report of a workshop by the Kaleidoscope network of Excellence Mobile Learning Initiative*. Nottingham, UK: University of Nottingham: 7-11.
- Wishart, J. 2009. Use of mobile technology for teacher training. In Ally, M.

(ed). *Mobile learning transforming the delivery of education and training*.
Edmonton, Canada: AU Press, Athabasca University: 265-278.

Yang, J. C., Huang, Y. T., Tsai, C. C., Chung, C. I. & Wu, Y. C. 2009. An automatic multimedia content summarization system for video recommendation. *Educational Technology & Society*, 12(1):49-61, January.

Young, P. A. 2008. The culture based model: constructing a model of culture. *Educational Technology & Society*, 2(11):107-118, April.

APPENDICES

APPENDIX A: ETHICAL CLEARANCE

Faculty of Informatics and Design

Research Ethics Review Checklist

All post-graduate students and researchers are required to complete this form before commencing with the research. Post-graduate students are requested to please submit this form together with their proposal submission to the FRC. (Where applicable mark relevant boxes with an X)

Project Title: Toward a Theory of Mobile Learning: the Design of Learning Spaces for the Higher Education Landscape

Applicant / Researcher:	Title, name & surname: Mr Mohamed Osman Mohamed El-Hussein		Under-graduate	Post-graduate	X	Staff
	Office Telephone: 469 - 1142	Cell: 084 888 6327	eMail: mohammed.cle@gmail.com			

Supervisor (if applicable):	Title, name & surname: Prof. Dr Johannes C. Cronje					
	Office Telephone: 469 - 1048	Cell: 042 558 5311	eMail: cronje@cput.ac.za			

Research Checklist:		Yes	No
1:	Does the study involve participants who are unable to give informed consent? Examples include children, people with learning disabilities, or your own students.		X
2:	Will the study require the co-operation of a gatekeeper for initial access to the groups or individuals to be recruited? Examples include students at school, members of self-help groups, residents of nursing homes — anyone who is under the legal care of another.		X
3:	Will it be necessary for participants to take part in the study without their knowledge and consent at the time — for example covert observation of people in non-public places?		X
4:	Will the study with the research subject involve discussion of sensitive topics? Examples would include questions on sexual activity or drug use.		X
5:	Will the study involve invasive, intrusive, or potentially harmful procedures of any kind (e.g. drugs, placebos or other substances to be administered to the study participants)?		X
6:	Will the study involve prolonged or repetitive testing on sentient subjects?		X
7:	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?		X
8:	Does your research involve environmental studies which could be contentious or will your outcome use materials or processes that could damage the environment more than is necessary?		X

If you have answered 'No' to all questions, submit the completed and signed form to the FRC together with the research proposal.

If you have answered 'Yes'...

If you have answered 'Yes' to any question, kindly attach a report describing more fully how you plan to deal with the ethical issues raised by your research. It does not mean that you cannot do the research, only that your proposal will need to be approved by the Research Ethics Committee. You will need to submit your plans for addressing the ethical issues raised by your proposal to the FID Research Ethics Committee.

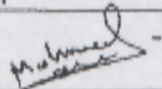
Declaration:

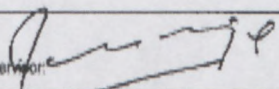
As Researcher / Applicant I acknowledge that it is my responsibility to:

- Follow the CPUT Code of Practice on Ethical Standards (which is currently being drafted) and any relevant academic or professional guidelines in the conduct of my study; and
- That this includes providing appropriate information sheets and consent forms; and ensuring confidentiality in the storage and use of data.
- Furthermore that any significant change in the questions, design, or conduct over the course of the research must be notified to my supervisor who must inform the Research Ethics Committee if new approval is needed.

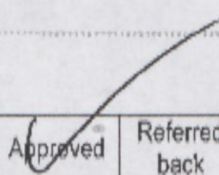

By my signature below I declare that I am not aware of any potential conflicts of interest, other than those declared on THIS form, which may influence the ethical conduct of my study.

Signatures:

Researcher: 
Date: 27.11.2008

Supervisor: 
Date: 27.11.08

FID Research Ethics Committee:

<p><i>Ethics issues appear to be adequately addressed in the proposal.</i></p>		
<p>Approved </p>	<p>Referred back</p>	<p> Chairperson</p>
		<p>2008/12/01 Date:</p>

FIDethics@cput.ac.za

APPENDIX B: INTERVIEWS TIMETABLE

Interviewees	Locations	Dates	Duration times
Respondent 1	Pretoria	23 rd June, 2009	10h00 – 11h30
Respondent 2	Pretoria	24 th June, 2009	14h30 – 15h30
Respondent 3	Pretoria	25 th June, 2009	08h30 – 10h00
Respondent 4	Cape Town	9 th May, 2010	08h30 – 09h30
Respondent 5	Cape Town	11 th May, 2010	13h30 – 14h30

APPENDIX C: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 1)



Cape Peninsula
University of Technology

Faculty of Informatics and Design

Interviewee consent form

Dear interviewee

I would like to extend my sincere gratitude to you, for your invaluable contributions as an interviewee during the data collection phase of my research. For ethical reasons, please sign this consent agreement as confirmation that you willingly participated in the process and also permitted the researcher to record the interviews. Please note that:

1. The information collected during the interviews has not been or will not be used elsewhere except in the research purposes.
2. Your personal details and/or institutional affiliation have not been revealed in the thesis.
3. The information will be kept strictly confidential at all times.

Your signature:.....

E.P. de Crom

Thank you

Mohamed Osman M. El-hussein (Researcher)



Cape Peninsula
University of Technology

Faculty of Informatics and Design

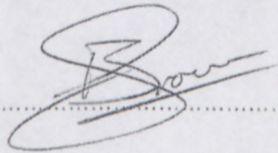
Interviewee consent form

Dear interviewee

I would like to extend my sincere gratitude to you, for your invaluable contributions as an interviewee during the data collection phase of my research. For ethical reasons, please sign this consent agreement as confirmation that you willingly participated in the process and also permitted the researcher to record the interviews. Please note that:

1. The information collected during the interviews has not been or will not be used elsewhere except in the research purposes.
2. Your personal details and/or institutional affiliation have not been revealed in the thesis.
3. The information will be kept strictly confidential at all times.

Your signature:.....

 27/10/10

Thank you

Mohamed Osman M. El-hussein (Researcher)



Cape Peninsula
University of Technology

Faculty of Informatics and Design

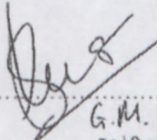
Interviewee consent form

Dear interviewee

I would like to extend my sincere gratitude to you, for your invaluable contributions as an interviewee during the data collection phase of my research. For ethical reasons, please sign this consent agreement as confirmation that you willingly participated in the process and also permitted the researcher to record the interviews. Please note that:

1. The information collected during the interviews has not been or will not be used elsewhere except in the research purposes.
2. Your personal details and/or institutional affiliation have not been revealed in the thesis.
3. The information will be kept strictly confidential at all times.

Your signature:.....


G.M. Kruger
2010-10-22

Thank you

Mohamed Osman M. El-hussein (Researcher)



Cape
Peninsula
University
of Technology

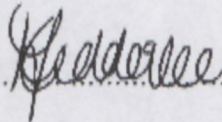
Faculty of Informatics and Design

Interviewee consent form

Dear interviewee

I would like to extend my sincere gratitude to you, for your invaluable contributions as an interviewee during the data collection phase of my research. For ethical reasons, please sign this consent agreement as confirmation that you willingly participated in the process and also permitted the researcher to record the interviews. Please note that:

1. The information collected during the interviews has not been or will not be used elsewhere except in the research purposes.
2. Your personal details and/or institutional affiliation have not been revealed in the thesis.
3. The information will be kept strictly confidential at all times.

Your signature:..........*K. EL-HUSSEINI*.....

Thank you

Mohamed Osman M. El-husseini (Researcher)

APPENDIX G: SIGNED INTERVIEWS CONSENT FORM (RESPONDENT 5)



Cape Peninsula
University of Technology

Faculty of Informatics and Design

Interviewee consent form

Dear interviewee

I would like to extend my sincere gratitude to you, for your invaluable contributions as an interviewee during the data collection phase of my research. For ethical reasons, please sign this consent agreement as confirmation that you willingly participated in the process and also permitted the researcher to record the interviews. Please note that:

1. The information collected during the interviews has not been or will not be used elsewhere except in the research purposes.
2. Your personal details and/or institutional affiliation have not been revealed in the thesis.
3. The information will be kept strictly confidential at all times.

Your signature: .....

Thank you

Mohamed Osman M. El-hussein (Researcher)

APPENDIX H: A CERTIFICATE OF LANGUAGE EDITING



BrainWaves

Research & Training cc.

CK 97/20575/23
VAT Reg. No. 4290171067

20 February 2011


To whom it may concern

Certificate of language editing

This is to certify that I have edited the thesis "Towards a Theory of Mobile Learning: the Design of Learning Spaces for the Higher Education Landscape" by Mohamed Osman Mohamed El-Hussein, in terms of language usage and expression.

I focused on language issues, including grammar, tenses, consistency of terminology, sentence construction, and UK spelling. I inserted comments and suggestions, for the attention of the student, where meaning needed to be clarified, and where passages needed to be rewritten. The thesis was edited before it reached its final state and has not been subsequently reviewed.

Signed



J.W. Fresen (PhD)

June 2010

CAPE PENINSULA
UNIVERSITY OF TECHNOLOGY

