The integration of learning technologies in open distance learning at the North-West University

Hendrik Daniel Esterhuizen

Thesis submitted for the degree Doctor of Philosophy at the North-West University, Potchefstroom Campus

Promoter: Prof. Dr. A. Seugnet Blignaut

December 2012

DEDICATION

I dedicate this thesis to my wife Elsa

Without her love, constant support and encouragement,
this study would not have been possible

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to:

- My study supervisor and co-author, Prof A Seugnet Blignaut, for the enormous investment of effort, dedication and shared wisdom. I would strive to reinvest the acquired experience and appreciation for transformative people-centred research in Technology Enhanced Learning!
- Prof E.J. Spamer, the Director of the School for Continuing Teacher Education, North-West University, for unwavering support, patience and encouragement. Permission for and facilitation of this study through the SCTE permitted the development of a framework for integration of learning technology, emerging from collective experience and wisdom of the practitioners in South African distance education execution guided by his leadership
- Faculty, support staff and teacher-students of the SCTE, NWU. Concern for education in Africa binds us together in a calling to facilitate learning; on behalf of the future generation and current lifelong learners such as ourselves. Working at the SCTE these past two years has been a joyous experience as a result of the powerful positive group spirit, the encouragement and cooperation afforded to me. Pieter Badenhorst and Jacques Pienaar, my colleagues at e-Learning Support enabled me to perform this research while they were carrying an additional burden. Their sacrificial dedication and pleasant demeanours enabled us to progress in strides, even while much of my energy was consumed by this study
- Dr Suria M. Ellis of NWU Statistical Services for statistical analysis, guidance and co-authoring research articles in this study. Discovering meaning in data with exciting and enjoyable expectancy through her honed experience and skill produced responsible research outcomes of meaningful real life pragmatic usefulness
- Christo Els, as co-author, for inspiration, insight and assistance in analysing quantitative data in collaboration with Dr Suria Ellis
- Mr. E. v. Z. Louw (Rassie), Manager: Teaching and Learning Technology, NWU, for involved discussions and inspiration to consider learning technology integration strategies for NWU
- The Ferdinand Postma Library at NWU, for the electronic database facilities enabling me to obtain literature on my own and for specific assistance in cases where I was unable to manage independently
- Financial support from North-West University Research Support as well as the National Research Foundation project ODL for TEL
- The privilege of an extended study tour in conjunction with the presentation at the 24th ICDE in Bali, October 2011. This enabled me to collaborate with professors and peers at the Open University, UK and the Indira Gandhi Open University in Delhi, India for extending my understanding of technology use in Open Distance Learning.

Soli Deo Gloria

ABSTRACT

North-West University in South Africa is committed to expanding use of learning technologies for contact and distance education students by augmenting the existing NWU teaching and learning policy with an e-learning policy. The School of Continuing Teacher Education at North-West University is currently training about 24 000 in-service teacher students through Open Distance Learning. Only a few students submit assignments in typed format and seldom electronically. Students rarely use electronic technologies to augment their learning, and the SCTE employs few to support students. This does not comply with the South African Government's policy on e-Education that demands information and communication technology mastery in teacher training.

The aim of this research was integration of learning technologies in open distance learning at SCTE NWU through recommendations compiled in a sociologically transformative emergent implementation framework. The researcher followed a concurrent mixed-method sociologically transformative approach, focussing on the use of technology for social empowerment to cross the digital divide, through a theoretical lens of ICT for development. The lived experience in the natural setting of distance education students, lecturers, and involved stakeholders was used as initial data collection, informed by a continuous literature study of emergent learning technology use.

Purposeful sampling was used during participant selection. The role of the researcher was that of participant observer, interviewer, and human instrument, from a position of methodological pragmatism as a method of inquiry. Using a design-based research approach, the thesis addresses the main research question through five research papers; each addressing one of the sub-questions as design-based research cycles, while collectively addressing the research problem to address the main research question. Non-standardised measuring instruments were developed based on themes identified from literature and the analysis of qualitative data. Significant barriers to population-wide ICT adoption exist. Strong intentions of perseverance in attaining functional computer literacy are evident. Support and enablement are required to promote trust to attempt using computers, necessary to obtain self-confidence through accomplishment. In this way perseverance to attain functional computer literacy may be cultivated.

The study presents a model for intention to use, confidence, trust and perseverance in attaining computer literacy competence with statistically significant standardised regression

weights. In terms of affective responses of students during computer literacy training, a two-dimensional model for computer literacy learning emotions is presented. Perceptions during professional development produced a model for faculty development towards socially transformative learning technology integration for open distance learning. The researcher also presents a people-technology interaction in teaching and learning model in the fifth paper. A distinction is made between reactionary interventions and pre-emptive unobtrusive seamless support, based on requirements identified through bottom-up feedback listening to latent requests of participants. Technology-enhanced learning integration should be legitimised through visible commitment from the university as institution. Lecturer training, innovative planning of time issues, acquisition of appropriate infrastructure, buying in from the institution and IT support services, and support of teacher-students are all essential for evolvement towards an e-mature organisation for the delivery of ODL to vast numbers of newly industrialised context clients.

Keywords

1. Computer literacy
2. e-Learning
3. Faculty training
4. Higher Education
5. Interactive white boards
6. Learning technology integration
7. Open Distance Learning
8. Student support
9. Teacher training
10. Technology adoption
11. Technology Enhanced Learning (TEL)
12. Technophilia
13. Technophobia

OPSOMMING

Die Noordwes-Universiteit in Suid Afrika is verbind daartoe om die gebruik van leertegnologieë deur studente in kontak- sowel af afstandsonderrig uit te brei deur versterking van die bestaande onderrigleerbeleid met behulp van 'n e-leerbeleid. Die Skool vir Voortgesette Onderwysersopleiding aan die Noordwes-Universiteit lei tans 24000 praktiserende onderwysers op deur Oop Afstandsleer. Slegs 'n klein persentasie van hierdie studente handig getikte opdragte in en weinig dien dit elektronies in. Studente maak selde van elektroniese tegnologieë gebruik om hulle leer te versterk, en die SVO wend slegs enkeles hiervan aan om studente te ondersteun. Dit stem nie ooreen met die Suid Afrikaanse regering se beleid oor e-Leer nie, want hierdie beleid vereis dat onderwysers wat opgelei word ook inligtings- en kommunikasietegnologie bemeester.

Die doel van hierdie navorsing was om leertegnologieë in oop afstandsleer aan die SVO aan die NWU te integreer deur aanbevelings te maak binne 'n raamwerk van ontluikende maatskaplik transformerende implementering. Die navorser het 'n konkurrente gemengde metode met 'n maatskaplik transformerende benadering gevolg, gefokus op die gebruik van tegnologie vir maatskaplike bemagtiging om sodoende die digitale gaping te oorbrug, deur 'n teoretiese lens van IKT vir ontwikkeling. Die geleefde ervaring in die natuurlike omgewing van afstandstudente, dosente en alle rolspelers is aanvanklik gebruik vir data-insameling. Deelnemers is doelbewus geselekteer, en die rol van die navorser was die van deelnemende waarnemer en menslike instrument vanuit metodologiese pragmatisme as ondersoekmetode. Deur gebruik te maak van ontwerp-gebaseerde navorsing, behandel die tesis die primêre navorsingsvraag deur vyf navorsingsartikels waarvan elk een van die sub-vrae aanspreek. Nie-gestandaardiseerde navorsingsinstrumente is ontwikkel, gebaseer op die temas geïdentifiseer uit die literatuur en die analise van kwalitatiewe data. Betekenisvolle hindernisse staan in die pad van landwye aanvaarding van IKT. Daar is duidelike aanduidings van toegewyde voorneme om funksionele rekenaargeletterdheid te bereik. Ondersteuning en bemagtiging word vereis ten einde die nodige vertroue te skep om 'n poging aan te wend om rekenaars te gebruik, wat 'n voorvereiste is vir selfvertroue en verwesenliking.

Die studie bied 'n model vir die voorneme om vrymoedigheid, vertroue en deursettingsvermoë aan te wend ten einde funksioneel rekenaargeletterd te raak met statisties betekenisvolle gestandaardiseerde regressiewaardes. Betreffende affektiewe response van studente gedurende opleiding in rekenaargeletterdheid, word 'n twee-

dimensionele model aangebied van emosies ervaar tydens sodanige opleiding. Persepsies tydens professionele ontwikkeling het ’n model opgelewer vir die ontwikkeling van maatskaplik transformerende leertegnologie in die fakulteit, en die integrasie daarvan tydens oop afstandsleer. Die navorser bied ook in die vyfde artikel ’n model van wisselwerking tussen mens en tegnologie vir onderrig en leer. Daar word onderskei tussen reaksionêre intervensies en voorafbepaalde volgehoue ondersteuning wat gebaseer is op die behoeftes geïdentifiseer deur onuitgesproke versoeke in die terugvoer van deelnemers. Die integrasie van tegnologie-verrykte leer as mikpunt behoort gelegitimeer te word deur duidelik waarneembare verbintenis en onderneming van die universiteit as instansie. Opleiding van dosente, innoverende tydsbeplanning, die verkryging van gepaste infrastruktuur, die inkoop van die institusie en IT ondersteuningsdienste sowel as ondersteuning van onderwyser-studente is alles nodig vir ontwikkeling tot ’n e-volwasse organisasie vir die aflewering van OAL aan reusegetalle pas-geïndustrialiseerde kliënte.

Sleutelwoorde:

1. Akademici opleiding
2. e-Leer
3. Hoër Onderwys
4. Interaktiewe witborde
5. Leertegnologie integrasie
6. Liefde vir tegnologie
7. Onderwysersopleiding
8. Oop Afstandsleer
9. Rekenaargeletterdheid
10. Studenteondersteuning
11. Tegnologieaanvaarding
12. Tegnologie-verrykte Leer
13. Tegnologievrees

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT
POTCHEFSTROOM CAMPUS

SOLEMN DECLARATION

Solemn declaration by student

I, __Hendrik Daniel Esterhuizen___,
declare herewith that the thesis/~~dissertation/mini-dissertation/article~~ entitled **(exactly as registered/approved title)**,
__ **The integration of learning technologies in open distance learning at the North-West University** ____

which I herewith submit to the North-West University Potchefstroom Campus, in compliance / ~~partial compliance~~ with the requirements set for the _____PhD_____ degree, is my own work, has been language edited and has not already been submitted to any other university.

I understand and accept that the copies that are submitted for examination are the property of the University.

Signature of student_____ University number__21466386__

Signed at ___Potchefstroom___ this 2nd day of _October__2012

Declared before me on this 02 day of October 2012

JAN FREDEDRICK SCHUTTE
Ex officio Commissioner of Oaths, ADMINISTRATIVE OFFICER
North-West University - Potchefstroom Campus
Private Bag X6001, Potchefstroom, 2520

Commissioner of Oaths: _____

PLEASE NOTE: If a thesis/dissertation/mini-dissertation/article of a student is submitted after the deadline for submission, the period available for examination is limited. No guarantee can therefore be given that (should the examiners' reports be positive) the degree will be conferred at the next applicable graduation ceremony. It may also imply that the student would have to re-register for the following academic year.

Declaration by supervisor / promoter / research director / dean

The undersigned declares:

1.1 that the student attended an approved module of study for the relevant qualification and that the work for the course has been completed or that work approved by the Senate has been done;

1.2 that the student has complied with the **minimum duration** of study as stated in the yearbook;

1.3 the student is hereby granted permission to submit his/her mini-dissertation/dissertation or thesis;

1.4 that registration/amendment of the title has been approved;

1.5 that the appointment/amendment of examiners has been finalised and

1.6 that all the procedures have been followed according to the Manual for Postgraduate Studies.

Signature of Supervisor/Promoter: _____ Date: 2012 11 02

Signature of Research Director: _____ Date:_____

Signature of Dean: _____ Date:_____

CERTIFICATE OF PROOFREADING

H C Sieberhagen	*Translator and Editor*
SATI no 1001489	*082 3359846*

CERTIFICATE ISSUED ON 1 NOVEMBER 2012

I hereby declare that I have linguistically edited the dissertation submitted by Mr Hendrik Daniel Esterhuizen for the PhD degree.

The integration of learning technologies in open distance learning at the North-West University

H C Sieberhagen
SATI number **1001489**
ID 4504190077088

NORTH-WEST UNIVERSITY
YUNIBESITI YA BOKONE-BOPHIRIMA
NOORDWES-UNIVERSITEIT

Private Bag X6001, Potchefstroom
South Africa 2520

Tel: (018) 299-4900
Faks: (018) 299-4910
Web: http://www.nwu.ac.za

Ethics Committee
Tel +27 18 299 4850
Fax +27 18 293 5329
Email Ethics@nwu.ac.za

Prof S Blignaut

Ethics Approval of Project

The North-West University Ethics Committee (NWU-EC) hereby approves your project as indicated below. This implies that the NWU-EC grants its permission that provided the special conditions specified below are met and pending any other authorisation that may be necessary, the project may be initiated, using the ethics number below.

Project title:
The integration of learning technologies in open distance learning at the North-West University

Student working on project: HD Esterhuizen

Ethics number: NWU-00032-10-A2

Approval date: 2010/04/22 **Expiry date:** 2015/04/21

Special conditions of the approval (if any): None

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- *The project leader (principle investigator) must report in the prescribed format to the NWU-EC:*
  - *annually (or as otherwise requested) on the progress of the project,*
  - *without any delay in case of any adverse event (or any matter that interrupts sound ethical principles) during the course of the project.*
- *The approval applies strictly to the protocol as stipulated in the application form. Would any changes to the protocol be deemed necessary during the course of the project, the project leader must apply for approval of these changes at the NWU-EC. Would there be deviated from the project protocol without the necessary approval of such changes, the ethics approval is immediately and automatically forfeited.*
- *The date of approval indicates the first date that the project may be started. Would the project have to continue after the expiry date, a new application must be made to the NWU-EC and new approval received before or on the expiry date.*
- *In the interest of ethical responsibility the NWU-EC retains the right to:*
  - *request access to any information or data at any time during the course or after completion of the project;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the project are revealed or suspected,*
    - *it becomes apparent that any relevant information was withheld from the NWU-EC or that information has been false or misrepresented,*
    - *the required annual report and reporting of adverse events was not done timely and accurately,*
    - *new institutional rules, national legislation or international conventions deem it necessary.*

The Ethics Committee would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the Ethics Committee for any further enquiries or requests for assistance.

Yours sincerely

Prof MMJ Lowes
(chair NWU Ethics Committee)

TABLE OF CONTENTS

Synopsis, Conclusions, Framework for Technology Enhanced Learning at the School of Continuing Teacher Education at North-West University and Recommendations

LIST OF FIGURES

The integration of learning technologies in open distance learning at the North-West University

Article 1: A Localized Socially Transformative Learning Technology Integration Framework for ODL

Article 2: ODL Students' Perceived Computer Literacy Competencies, Expectations of Support, Intention to Use and Perseverance

Article 3: Computer Literacy Learning Emotions of ODL Teacher-Students

Article 4: Looking out and looking in: Exploring a case of faculty perceptions during e-learning staff development

LIST OF TABLES

Synopsis, Conclusions, Framework for Technology Enhanced Learning at the School of Continuing Teacher Education at North- West University and Recommendations

LIST OF ADDENDA

The addenda are available as a .PDF format file on the CD-ROM at the back of the thesis.

LIST OF ACRONYMS

AACE	Association for the Advancement of Computing in Education
ACE	Advanced Certificate in Education
ADSL	Asymmetric Digital Subscriber Lines
APA	American Psychological Association
BEd Hons	Honours Degree in Education
CAA	Computer Aided Assessment
CAI	Computer Assisted Instruction
CAL	Computer Aided Learning
CBL	Computer Based Training
CBT	Computer Based Training
CD-ROM	Compact Disk - Read Only Memory
CERI	Centre for Educational Research and Innovation
CMC	Computer Mediated Communication
CSIR	Council for Scientific and Industrial Research
DBR	Designed-Based Research
DoE	Department of Education
DVD	Digital Versatile Disks
ELTI	Embedding Learning Technologies Institutionally
ERIC	Educational Resources Information Center
HCI	Human-Computer Interface
HEI	Higher Education Institution
ICDE	The International Council for Open and Distance Education
ICT	Information Communication Technologies
ICTE	Information Communication Technology for Education
IRRODL	International Review of Research in Open Distance Learning
IT	Information Technology
IWB	Interactive White Board
KHz	Kilohertz
LMS	Learning Management System
M-learning	Mobile learning
MOOC	Massive Open Online Course
NADEOSA	National Association of Distance Education Organisations of South Africa
NIC	Newly Industrialized context
NPDE	National Professional Diploma in Education

NWU	North-West University
ODL	Open Distance Learning
OECD	Organization for Economic Cooperation and Development
OER	Open Education Resource
SADTU	South African Democratic Teachers Union
SCTE	School of Continuing Teacher Education
SEM	Structural Equation Model
SITES	Second Information Technology in Education Study
SMS	Short Message Service
TAM	Technology Acceptance Model
TEL	Technology Enhanced Learning
TESSA	Teacher Education in Sub-Saharan Africa
TOJET	The Turkish Online Journal of Educational Technology
TPACK	Technological Pedagogical Content Knowledge
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UODL	Unit for Open Distance Learning
USA	United States of America
USB	Universal Serial Bus
VLE	Virtual Learning Environment
Wi-Fi	Wireless Fidelity

GLOSSARY

Asynchronous online learning	Asynchronous online learning refers to students learning away from assistance of lecturers and facilitators and contributions to the communication process between participants are not taking place in the same time span (synchronously), but sequentially, possibly interspaced with significant periods of inactivity
Atlas.ti™	Atlas.ti™ is a computer-based qualitative data analysis program to analyse the qualitative sections of the data according to an open thematic approach
Basic computer literacy	Basic computer literacy in this study refers to the ability to successfully and productively use desktop computer boxes or portable versions of the same, also referred to as digital literacy
Benchmarking	Benchmarking is the process of comparing one's business processes and performance metrics to industry bests or best practices from other industries. Dimensions typically measured are quality, time and cost. In the process of benchmarking, management identifies the best firms in their industry, or in another industry where similar processes exist, and compare the results and processes of those studied (the "targets") to one's own results and processes
Competence	Competence is about sharing knowledge, implying the relation of competence to performance, which links competence to action in social situations
Design-based research	Design-based research is a research methodology commonly used by researchers in the Learning Sciences. Within Design-Based Research methodology, interventions are conceptualized and then implemented in natural settings in order to test the ecological validity of dominant theory and to generate new theories and frameworks for conceptualizing learning, instruction, design processes, and educational reform
Deutero-loop learning	Deutero-loop learning takes place where the learning process itself is examined and improved upon
Distance Education	Distance education or distance learning is a field of education that focuses on teaching methods and technology with the aim of delivering teaching, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom
eCompetence	eCompetence is at its core dealing with the development of personal competences in the creative use of ICT. Personal eCompetence of an individual academic teacher describes the teacher's ability in using ICT in their teaching and course delivery. Institutional eCompetence describes the structures, processes and policies in place, by which a university aims to embed the ICT use into its core tasks of research and education
e-Maturity	e-Maturity indicates the extent to which organizations make strategic and effective use ICT in order to improve educational outcomes
e-Readiness	e-Readiness is the ability to use information and communication technologies (ICT) to develop one's economy

	and to foster one's welfare
Framework	In this study, the development of a framework was justified as the a result of the existence of (i) significant identifiable existing uncertainties, (ii) clear short term requirements for action, (iii) possibilities to address uncertainties through distinct interventions, (iv) a need for continuation of effort and persistence during intermediate phases of transition where (v) proceeding actions are dependent on evolving perceptions, maturing attitudes and commitments (vi) assessment of initiatives and evaluations of performance target attainment and (vii) reflection and research to perform cyclic review of long term goals
G-20	The Group of Twenty, or G20, is the premier forum for international cooperation on the most important aspects of the international economic and financial agenda. It brings together the world's major advanced and emerging economies. The G20 includes 19 country members and the European Union
ICT (according to the South African Government White Paper on e-Education)	Information and communication technologies (ICTs) represent the convergence of information technology and communication technology. ICTs are the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable the processing, management and exchange of data, information and knowledge
ICT literacy	ICT literacy can be primarily defined as the mastery of technical skills and broadened to include critical cognitive skills such as reading, numeracy, critical thinking and problem solving and the integration of those skills with technical skills and knowledge
Instructivism	Instructivism incorporates a teacher-directed planned curriculum, with purposeful teaching at its core. It follows two basic assumptions. First, the purpose of instruction is to help the learner understand and interact with the world; and, secondly, learners should be directed by instructors who make the decisions about the content and sequence of the learning
K-12	Kindergarten to twelfth grade: used for talking about the 13 years of school before university education
Learning technology	The application of technology for the enhancement of teaching, learning and assessment
Lifelong Learning	Lifelong Learning is the ongoing, voluntary, and self-motivated pursuit of knowledge for either personal or professional reasons. Therefore, it not only enhances social inclusion, active citizenship and personal development, but also competitiveness and employability
Media literacy	Media literacy is the understanding of the role of media in teachings, requirements in different situations and implications for lecturers
Pragmaticisim	Pragmaticisim is used to indicate (a) the acceptance of reality; (b) the role of the future as the space within which things may be known; and (c) a purport, or a commitment to purposive action, following a plan with an end or highest good
Pragmatism	This study was performed from a position of methodological pragmatism as a method of inquiry. The researcher as pragmatist aims to be functional while concentrating on what is considered important to study in a way that is congruent with his value system, including variables and units of analysis that

	he feels are most appropriate for finding an answer to the research question
Seamless support	Seamless technology support is effective when participants in the learning experiences are unaware of the efforts and costs involved in the provision of enjoyable and lasting learning experiences
Teaching skills	Teaching skills refers to duties and responsibilities in terms of the subject, as well as knowledge on instructional models, teaching methods and didactical planning
Technological Pedagogical Content Knowledge (TPACK)	Technological Pedagogical Content Knowledge (TPACK) is a framework to understand and describe the kinds of knowledge needed by a teacher for effective pedagogical practice in a technology enhanced learning environment
Technology Acceptance Model	Technology Acceptance Model consists of two types of beliefs: the technology's perceived usefulness and its perceived ease of use
Technophilia	Technophilia refers generally to a strong enthusiasm for technology, especially new technologies such as personal computers, the Internet, mobile phones and home cinema
Technophobia	Technophobia is the fear or dislike of advanced technology or complex devices, especially computers
Underqualified teachers	Underqualified teachers' qualifications are inadequate for appropriate teaching positions and need upgrading
Unqualified teachers	Unqualified teachers do not have any teaching qualifications