

https://dspace.org/

# The integration of blended learning into the undergraduates occupational therapy curriculum

**Barnard-Ashton, Paula Monique**

**2018**
https://hdl.handle.net/10539/26984

Downloaded from a DSpace repository. https://dspace.org/

# The Integration of Blended Learning into the Undergraduate Occupational Therapy Curriculum

Paula Monique Barnard-Ashton

Original published work submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy.

Johannesburg, 2018

# Declaration

I, Paula Monique Barnard-Ashton student number 9102997D declare that this Thesis is my own work and that I contributed adequately towards research findings published in the articles stated below which are included in my Thesis.

…….  ……day of ……..……., 2018

Paula Monique Barnard-Ashton

Primary Supervisor

…….  ……day of ……..……., 2018

Prof Alan Rothberg

Second Supervisor

…….  ……day of ……..., 2018

Prof Patricia McInerney

To my children:

*Morgan Anne Barnard*

*and*

*Jonathan Ashton*

# Abstract

The Department of Occupational Therapy (DOT) recognised the threat of massification to the ability to graduate professional and competent generalist occupational therapists. Success-rates were dropping in the diversified student body and lecturer workload was increasing, contributing to poor research publication output. Blended Learning (BL) was suggested as a strategic opportunity to manage the undergraduate occupational therapy curriculum which was delivered through Problem Based Learning (PBL). The researcher was nominated to take the lead in driving the process, initiating this Participatory Action Research (PAR). Over six academic years the lecturers of the DOT, through Legitimate Peripheral Participation (LPP), participated in curriculum redesign and content development activities, which crafted the BL process. The PAR research design facilitated the insider positionality of the researcher to investigate the impact of BL on teaching and learning within the DOT. The stakeholders in the study were the lecturers of the DOT, the students enrolled in the Bachelor of Sciences in Occupational Therapy degree between 2010 and 2015, and the School e-Learning Project team. Quantitative and qualitative methodologies were employed throughout the PAR. Quantitative data were analysed for effect due to the small student and staff population. Qualitative data were analysed using Strauss' grounded theory and Brookfield's lenses of critical reflection. This thesis presents five papers of which two are macro-level PAR studies and three are micro-level PAR studies. The results yielded two core themes: the drivers of change and the outcomes of BL. The outcomes of BL demonstrated that when integrating BL over a long-term intervention the effect of habituation on student performance is positive, students perceive BL to have a positive effect on their knowledge gain and that when BL activities have the 'just right challenge' students are interested in the learning process and find it beneficial to their learning. The six drivers of change provide guideline criteria to consider when integrating BL into PBL curricula with similar contexts; namely: Buy-in and goodness of fit, Being evidence-based, Just do it!, Support, Students are primed for BL, and the hurdles to BL. The lecturers of the DOT believe that 'there is no going back!"


Ethical clearance for this thesis was issued through the Human Research Ethics Committee (Medical) with the following numbers: M090920, M160877 and M141168 (refer Appendix A)

The originality report through Turnitin presented in Appendix B shows 14% similarity when the two published articles are excluded.

# Acknowledgements

Prof Alan Rothberg, thank you for nudging me into a new career path that has ignited my passion for teaching and learning with the ever-changing opportunities that technology offers. As head of the School of Therapeutic Sciences when this journey started, you were a mentor who believed in me, you sourced funding to ignite this research and then agreed to supervise this thesis. I am forever grateful for the hours you invested in me and this research as my supervisor and mentor.

Prof Patricia McInerney, my supervisor, I appreciate your steadfast guidance, facilitating my understanding of health sciences education, and your willingness to listen and give feedback as often as I needed it.

Prof Patricia de Witt (head of department) and the lecturers of the Department of Occupational Therapy, this journey into the unknown has been exciting and scary, yet we embraced it as a team. To Lyndsay Koch and Dr Fasloen Adams who co-authored papers in this thesis, your innovative spirit and dedication to the research is appreciated. To the students who enthusiastically embraced the opportunities to learn using technology, you all showed us what was possible if we just tried it. The way the occupational therapy curriculum is delivered at the University of the Witwatersrand has leapt into the twenty-first century.

eFundanathi – Learn with Us, which started out as the School's e-Learning Project: to April Papi Mthimkhulu and Phiwokhuhle Dlamini as graphic designers, your creativity has inspired me. Of particular note: Papi for the poster designs and Phiwe for the design of Figure 1.6. Lebogang Bogoshi, thank you for the technical support over the years and readiness to help lecturers succeed. As friend, occupational therapist and instructional designer in this research, Janine van der Linde, thank you for the brainstorming sessions, the writing retreats and co-authoring a paper for this thesis. This team created the strength and creativity that has and continues to drive innovation in teaching and learning. I am proud to be part of eFundanthi – Learn with Us!

Our current head of school, Prof Judith Bruce, thank you for continuing the belief in the value of blended learning and the role that eFundanathi plays in the School of Therapeutic Sciences. Thank you for supporting my dreams and always having my back.

Dr Mark Allen, without your support in hosting Moodle, upgrading the versions over the years and giving your insights into the world of technology and networking, this thesis would not have been possible. David Wafula and Starlen Sass, your server and programming skills are greatly appreciated. Thank you.

The support that I have had from those who walked this journey with me, Prof Patricia de Witt, Dr Fasloen Adams, Prof Hellen Myezwa, Janine van der Linde, Benita Olivier, Margot Graham, Rosemary Crouch, Dianne Manning and Lynette Williams to name a few, is greatly appreciated! Thank you for keeping me going, keeping me positive and caring for me.

Lastly and most importantly, the people closest to me, who have lived through the turmoil and successes, my frustrations and excitement. To my parents, Beaumont and Gillian Barnard, thank you for giving me the foundation to succeed and always being there for me. To my soulmate, Marc Ashton, I appreciate you always listening to my ideas, sitting through my brainstorming sessions, letting me use you as a sounding board and holding the fort. To my children, Morgan Barnard and Jonathan Ashton, for you I want to be the best person that I can be, which has motivated me throughout this thesis.

**Funding:**

This research was supported by funding from:

1. The Faculty of Health Sciences, Faculty Research Committee Individual Grant – supported the transcription of interviews and focus groups.

2. The Department of Higher Education and Training, Clinical Training Grant – Supported staffing of eFundanthi, equipment, operational funds and infrastructure development in the building housing the Department of Occupational Therapy.

## Agreement by co-authors

By signing this declaration, the co-authors listed below agree to the use of the article by the student as part of her Thesis.

**Paper 1**: Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy. *EDULEARN10 Proceedings*. 2010:492-499. **Student is sole author**.

**Paper 2**: First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment. *South African Journal of Occupational Therapy*. 2018; 48(2):3-11 **Student is the first author**. Status: Published

| Author | Name | Signature | Date |
|---|---|---|---|
| 1st Author | Paula Barnard-Ashton | | |
| 2nd Author | Janine van der Linde | | |
| 3rd Author | Alan Rothberg | | |
| 4th Author | Patricia McInerney | | |
| Comments by primary supervisor: | | | |

**Paper 3**: The influence of blended learning on student performance in an undergraduate occupational therapy curriculum. *South African Journal of Occupational Therapy*. 2014; 44(1):75-80. **Student is the first author**. Status: Published

| Author | Name | Signature | Date |
|---|---|---|---|
| 1st Author | Paula Barnard-Ashton | | |
| 2nd Author | Lyndsay Koch | | |
| 3rd Author | Alan Rothberg | | |
| Comments by primary supervisor: | | | |

**Article 4**: Digital apartheid and the effect of mobile technology during rural. *South African Journal of Occupational Therapy*. 2018; 48(2):20-25 **Student is the first author**. Status: Published

| Author | Name | Signature | Date |
|---|---|---|---|
| 1st Author | Paula Barnard-Ashton | | |
| 2nd Author | Fasloen Adams | | |
| 3rd Author | Alan Rothberg | | |
| 4th Author | Patricia McInerney | | |
| Comments by primary supervisor: | | | |

**Article 5**: The integration of blended learning into an occupational therapy curriculum: A qualitative reflection. *BMC Medical Education*. 2017; 17(135):1-13 **Student is the first author**. Status: Published

| Author | Name | Signature | Date |
|---|---|---|---|
| 1st Author | Paula Barnard-Ashton | | |
| 2nd Author | Alan Rothberg | | |
| 3rd Author | Patricia McInerney | | |
| Comments by primary supervisor: | | | |

# Publications

Four congress proceedings papers and four peer-reviewed journal articles arose from this study, of which one congress proceedings paper and four journal articles are presented in this thesis.

**Congress proceedings papers**

EDULEARN10 Proceedings, 2010:

- Paper 1: Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy. Pages 492-499. Author: Paula Barnard-Ashton
- Paper 2: Using wiki's in problem based learning: Student behaviour and attitude. Pages 581-586. Author: Paula Barnard-Ashton
- Paper 3: Designing e-curriculum books for undergraduate occupational therapy: Lessons learnt. Pages 6400-6405. Authors: April Papi Mthimkulu and Paula Barnard-Ashton

Proceedings of the 13th Annual Conference on World Wide Web Applications, 2011:

- Embedded information literacy: integrating the silos into e-learning. Volume 13: pages 5-16. Authors: Glenda Myers and Paula Barnard-Ashton

**Peer-reviewed journal articles - Published**

Barnard-Ashton PM, Koch L, Rothberg A. The influence of blended learning on student performance in an undergraduate occupational therapy curriculum. *South African Journal of Occupational Therapy*. 2014; 44(1): 75-80.

Barnard-Ashton PM, Rothberg A, McInerney P. The integration of blended learning into an occupational therapy curriculum: A qualitative reflection. *BMC Medical Education*. 2017; 17(135):1-13

Barnard-Ashton PM, van der Linde J, Rothberg A, McInerney P. First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment. *South African Journal of Occupational Therapy*. 2018; 48(2):3-11

Barnard-Ashton PM, Adams F, Rothberg A, McInerney P. Digital apartheid and the effect of mobile technology during rural fieldwork. *South African Journal of Occupational Therapy.* 2018; 48(2):20-15

## Congress and Academic Presentations

**Congress Papers**

Congress: EDULEARN10 - International Conference on Education and New Learning Technologies, 5th - 7th July 2010 Barcelona, SPAIN

- Paper: Designing e-curriculum books for undergraduate occupational therapy: Lessons learnt (co-authored with Papi Mthimkulu).

Congress: DeHUB and ODLAA Summit 2011-2021, 15th - 18th February 2011 Sydney, AUSTRALIA

- Paper: Student feedback of the inclusion of blended learning in third year undergraduate occupational therapy.

Congress: ZA-WWW2011, 14th – 16th September 2011 Johannesburg, SOUTH AFRICA

- Paper 1: Reflections of an eLearning project manager: Lessons learnt.
- Paper 2: Embedded Information Literacy: Integrating the silos into e-learning (co-presented and co-authored with Glenda Myers).

Congress: Occupational Therapy Association of South Africa Congress (OTASA) 2012 Durban, SOUTH AFRICA

- Paper: Reflections of lecturer's experiences of blended learning.

Congress: ZA-WWW2012, 7th-9th November 2012 Durban, SOUTH AFRICA

- Paper: Toy or Tool? Lecturers use tablet computing for teaching and learning in occupational therapy curricula.

Congress: Occupational Therapy Association of South Africa Congress (OTASA) 2014 Cape Town, SOUTH AFRICA

- Paper: The effect of blended learning in undergraduate occupational therapy.

Congress: South African Association of Health Educationalists (SAAHE) - Bambanani 2015 Working Together: Education for Change, 13th -16th September 2015 Johannesburg SOUTH AFRICA

- Paper: Reflections of lecturer experiences of blended learning in problem based learning.

Congress: South African Association of Health Educationalists (SAAHE) Congress 2016: Transformative Health Education in Motion, 22nd – 24th June 2016 Port Elizabeth, SOUTH AFRICA

- Paper: WebQuest as a mode for first year student orientation to online resources (co-author Janine van der Linde). http://www.saaheconf.co.za/images/Presentations/Thurs/P1/11h00BarnardWebQues.pdf

Congress: Occupational Therapy Association of South Africa (OTASA Congress: Harnessing the Changing Winds 14th -16th July 2016 Johannesburg, SOUTH AFRICA

- Paper 1: The effect of mobile technology during rural fieldwork on perceived knowledge gain.
- Paper 2: WebQuest as a mode for first year student orientation to online resources (co-author Janine van der Linde).

**Congress Posters**

Congress: EDULEARN10: International Conference on Education and New Learning Technologies. 5th - 7th July 2010 Barcelona, SPAIN

- Poster 1: Using wiki's in problem based learning: Student behaviour and attitude.
- Poster 2: Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy.
- Poster 3: Graphic design needs of a blended learning curriculum (co-authored with Papi Mthimkulu).

Congress: South African Association of Health Educationalists (SAAHE) 2012: From Practice to Practice. 21st – 23rd June 2012 Bloemfontein, SOUTH AFRICA

- Poster: Connecting the Dots: e-Learning during public health fieldwork (AWARD: runner-up poster prize).

**Congress Workshops**

South African Association of Health Educationalists (SAAHE) Congress (Johannesburg) 2010: Making education matter. 22nd – 24th July 2010: Structuring e-learning activities for sound pedagogy.

Nursing Education Association (NEA) and Forum of University Nursing Deans in South Africa (FUNDISA) Congress (Cape Town) 2010: Workshop e-Nursing: A Showcase of e-learning at Wits (co-presented with Siza Khoza).

Nursing Education Association (NEA) and Forum of University Nursing Deans in South Africa (FUNDISA) Congress (East London) 2012: e-learning in Nursing Education.

Occupational Therapy Association of South Africa Congress 2014 (Cape Town): Integrating e-learning strategies into teaching practice (co-presented with Lyndsay Koch).

## Awards associated to this research

**The University of the Witwatersrand's Vice-Chancellors Team Teaching Award**: In 2010 the DOT nominated the School of Therapeutic Sciences e-Learning Project Team for their contribution to teaching and learning practice in the DOT. The team, at the time, consisted of Paula Barnard-Ashton (researcher and project manager) and April Papi Mthimkhulu (graphic designer). The award was conferred on the team in October 2010.

**Congress runner-up poster prize**: 2012 Poster: Connecting the Dots: e-learning during public health fieldwork, at the South African Association of Health Educationalists (SAAHE) congress: From Practice to Practice. 21st – 23rd June 2012 Bloemfontein, SOUTH AFRICA.

**The University of the Witwatersrand's Vice-Chancellors Teaching and Learning Award – Team Category**: In 2017 the Head of School of the School of Therapeutic Sciences, Prof. Judith Bruce, nominated the School of Therapeutic Sciences e-learning Project Team (now named 'eFundanathi – Learn with Us') for the impact the team has had on driving and integrating blended learning throughout the school, with particular achievements in occupational therapy, and the design and development of a new active blended learning space – the eZone. eFundanathi currently consists of Paula Barnard-Ashton (researcher and project manager), Janine van der Linde (co-author on paper 2 and instructional designer), Phiwokuhle Dlamini (graphic designer) and Lebogang Bogoshi (eLearning support technician). The award was conferred on eFundanathi in October 2017.

# Table of Contents

## Contents


Declaration ..... ii
Abstract ..... iv
Acknowledgements ..... v
Agreement by co-authors ..... vii
Publications ..... viii
Congress and Academic Presentations ..... ix
Awards associated to this research ..... xi
Table of Contents ..... xii
List of Appendices ..... xvi
List of Figures ..... xvii
List of Tables ..... xviii
Contributions of Authors to the Study ..... xix
Nomenclature ..... xx
Chapter 1. Literature Review and Introduction ..... 1
1.1. Introduction ..... 1
1.2. The South African Higher Education Landscape ..... 2
1.2.1. The transition from apartheid to democracy ..... 2
1.2.2. Globalisation, managerialism and massification ..... 4
1.2.2.1. Globalisation ..... 4
1.2.2.2. Managerialism ..... 5
1.2.2.3. Massification ..... 6
1.2.3. Recent developments in the South African higher education landscape ..... 6
1.2.3.1. A medium knowledge-producing country ..... 7
1.2.3.2. Participation, throughput and attrition rates ..... 8
1.2.3.3. Transformation at WITS ..... 10
1.2.4. Conclusion to the state of higher education in South Africa ..... 13
1.3. Digital apartheid ..... 14
1.3.1. The material dimension ..... 15
1.3.1.1. Infrastructure ..... 15
1.3.1.2. Hardware and software ..... 17
1.3.2. The skills dimension ..... 19
1.3.2.1. Digital literacy ..... 19
1.3.2.2. Socio-cultural capital for digital literacy ..... 20

1.3.3. The virtual dimension ..... 20
1.3.3.1. The language-culture fit ..... 20
1.3.3.2. Content visibility ..... 21
1.3.4. Conclusion to the issue of digital apartheid ..... 22
1.4. Education theory and blended learning ..... 22
1.4.1. The evolution of the constructivist paradigm ..... 23
1.4.1.1. Cognitive-constructivism (Jean Piaget and Ernst von Glaserfeld) ..... 23
1.4.1.2. Social-constructivism (John Dewey and Lev Vygotsky) ..... 24
1.4.1.3. Conclusion to the constructivist paradigm ..... 25
1.4.2. Learning theory and design for the 21st century ..... 25
1.4.2.1. Connectivism: a learning theory for the 21st century ..... 26
1.4.2.2. 21st Century Learning Design (21CLD) ..... 27
1.4.2.3. Problem Based Learning (PBL) ..... 28
1.4.2.4. Blended Learning in Problem Based Learning ..... 30
1.5. Identifying the macro-level problem ..... 31
1.6. Research Paradigm ..... 33
1.6.1. Paradigm of the research method ..... 34
1.6.2. Paradigm of the intervention strategy ..... 34
1.7. Overview of the research design ..... 35
1.7.1. Research Approach ..... 35
1.7.2. Participatory Action Research ..... 35
1.8. Trustworthiness and validity of the research ..... 37
1.8.1. Trustworthiness ..... 37
1.8.1.1. Credibility ..... 38
1.8.1.2. Transferability ..... 38
1.8.1.3. Dependability ..... 39
1.8.1.4. Confirmability ..... 40
1.8.1.5. Authenticity ..... 40
1.8.2. Validity ..... 40
1.8.2.1. Dialogic validity ..... 40
1.8.2.2. Outcome validity ..... 41
1.8.2.3. Catalytic validity ..... 41
1.8.2.4. Democratic validity ..... 41
1.8.2.5. Process validity ..... 42
1.8.3. Researcher bias ..... 42
1.9. Worldview of the Researcher ..... 43

1.9.1. The researcher's journey ..... 44
1.10. Aim of the research ..... 45
1.10.1. Objectives of the research ..... 45
1.11. Conclusion ..... 46
Chapter 2. Paper 1 ..... 47
2.1. Introduction to paper 1 ..... 47
2.2. Paper 1: Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy. ..... 47
Chapter 3. Paper 2 ..... 56
3.1. Introduction to paper 2 ..... 56
3.2. Paper 2: First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment ..... 57
Chapter 4. Paper 3 ..... 67
4.1. Introduction to paper 3 ..... 67
4.2. Paper 3: The influence of blended learning on student performance in an undergraduate occupational therapy curriculum ..... 67
Chapter 5. Paper 4 ..... 74
5.1. Introduction to paper 4 ..... 74
5.2. Paper 4: Digital apartheid and the effect of mobile technology during rural fieldwork ..... 74
Chapter 6. Paper 5 ..... 81
6.1. Introduction to paper 5 ..... 81
6.2. Paper 5: The integration of blended learning into an occupational therapy curriculum: A qualitative reflection ..... 81
Chapter 7. Discussion and Conclusion ..... 95
7.1. Context of the thesis ..... 95
7.2. Objective A: Establish the platform and train the lecturers ..... 95
7.3. Objective B: Orientate students to the platform and address digital literacy ..... 98
7.4. Objective C: Collaborate with individual lecturers to address micro-level issues ..... 99
7.5. Objective D and E: Stakeholder reflection of the macro-level of the research and suggested guidelines for Blended Learning integration ..... 102
7.5.1. Drivers of change ..... 103
7.5.1.1. Buy-in and goodness of fit ..... 103
7.5.1.2. Being evidence-based ..... 104
7.5.1.3. Just do it! ..... 104
7.5.1.4. Support ..... 105
7.5.1.5. Students are primed for Blended Learning ..... 105
7.5.1.6. Hurdles to Blended Learning ..... 106

7.5.1.7. Conclusion to the drivers of change ..... 107
7.5.2. Outcomes of Blended Learning ..... 107
7.5.2.1. Success ..... 107
7.5.2.2. Student related outcomes ..... 107
7.5.2.3. Valued as a game-changing project ..... 108
7.5.2.4. Conclusion of the outcomes of Blended Learning ..... 108
7.6. Conclusion ..... 108
7.7. Limitations ..... 109
7.8. The way forward ..... 109
7.8.1. Further research ..... 110
Chapter 8. Reference List for Chapter 1 and 7 ..... 111
Appendices ..... 121

# List of Appendices


Appendix A: Ethical Clearance Certificates | Human Research Ethics Committee (Medical) ..... 121
Appendix B: Turn-It-In Report ..... 124
Appendix C: EDULEARN 10 congress poster of paper 1..... 126
Appendix D: EDULEARN 10 additional posters presented ..... 127
Appendix E: EDULEARN10 verbal presentation ..... 129
Appendix F: Copyright permission from EDULEARN editors for paper 1..... 133
Appendix G: SAAHE 2012 Congress poster of paper 4 – Poster prize |Runner-up..... 134
Appendix H: Letter from BioMed Central re Copyright for BMC Medical Education ..... 135

# List of Figures


Figure 1.1 The FTE enrolment of students at Wits 2010-2015[34,51-55] ..... 10
Figure 1.2 Student success-rates at WITS by race 2010-2015[34,51-55] ..... 11
Figure 1.3 Percentage of WITS student body headcount by race 2010-2015[34,51-55] ..... 12
Figure 1.4 VUMA rollout in Johannesburg as at April 2018[77] ..... 17
Figure 1.5 Analysis of the digital apartheid between two students ..... 22
Figure 1.6 The PAR cycles as applied across the studies in this research..... 36
Figure 7.1 Nursing - Renal conditions module on Sakai..... 97
Figure 7.2 Nursing - Renal conditions module on Moodle..... 97

# List of Tables

Table 1.1 South Africa's top five universities compared ..... 8

## Contributions of Authors to the Study

This study was designed using Participatory Action Research, which inherently drives collaboration of various stakeholders to the research process. Within this thesis my supervisors and three stakeholders contributed directly to the research design, implementation and writing of the publications herein. I hereby acknowledge their specific contributions towards the papers presented in this thesis.

The conceptualisation of the study, the research design and research protocol, were primarily crafted by myself, under the guidance and mentoring of my supervisors, Prof Alan Rothberg and Prof Patricia McInerney. While the research implementation was conducted independently, my supervisors were available for consultation as needed.

This thesis and the papers were drafted primarily by myself unless otherwise stated below. Prof Alan Rothberg and Prof Patricia McInerney reviewed and assisted in revising the body of this thesis. They reviewed each paper prior to submission to congress proceedings or peer-reviewed journal publication. They made suggestions as to the aspects of the study to focus on in order to best reflect the research process and outcomes.

The papers in this thesis were primarily written by myself, with collaboration from the stakeholders collaborating on crafting the blended learning activities and research design. They reviewed the papers prior to submission to the peer-reviewed, accredited journals and gave input as necessary. Thank you; Janine van der Linde (paper 2), Lyndsay Koch (paper 3) and Dr Fasloen Adams (paper 4).

# Nomenclature

| | |
|---|---|
| 21CLD | 21st Century Learning Design |
| ARWU | Academic Ranking of World Universities |
| BL | Blended Learning |
| CHE | Council on Higher Education |
| COREQ | COnsolidated criteria for REporting Qualitative research |
| DOT | Department of Occupational Therapy |
| F2F | Face-to-Face |
| Faculty | Faculty of Health Sciences |
| FTE | Full Time Equivalent |
| GB | Gigabyte |
| GEAR | Growth, Employment and Redistribution |
| HBIs | Historically Black Institutions |
| HPCSA | Health Professions Council of South Africa |
| HWIs | Historically White Institutions |
| ICT | Information and Communication Technology |
| LPP | Legitimate Peripheral Participation |
| NCHE | National Commission on Higher Education |
| NDP | National Development Plan |
| p. | page |
| PAR | Participatory Action Reearch |
| PBL | Problem Based Learning |
| RAM | Random-Access Memory |
| RDP | Reconstruction and Development Programme |
| SAFRI | Sub-Saharan African FAIMER Regional Institute |
| TCDs | Tablet Computing Devices |
| THEW | Times Higher Education World Rankings |
| VLE | Virtual Learning Environment |
| WITS | University of the Witwatersrand |

# Chapter 1. Literature Review and Introduction

## 1.1. Introduction

> *"Not only is higher education important in and of itself, but it is a barometer of societal content or discontent, as academics and students are perhaps the freest agents in democratic societies to think, reflect and act. It is apposite at this juncture, therefore, to take stock of higher education in South Africa; to reflect on its achievements, its shortcomings, its contradictions and its various roles and purposes, and to apply the wisdom of hindsight, such that we may look forward more clearly to a re-imagined future." Professor Themba Mosia in his foreword to South African higher education reviewed: Two decades of democracy*[1]

The post-apartheid South African higher education system of the mid-2000's was struggling under the pressure of massification and an influx of students with diverse cultural and socio-economic backgrounds[1,2]. Higher education institutions focused on improving Information and Communication Technology (ICT) infrastructure, and developed strategic plans for teaching and learning that embraced the use of ICT[1]. The internet was viewed as an opportunity to democratise learning when in 2004 the Department of Education gazetted the White Paper on e-Education[3], having the following primary goal:

> *"Every South African manager, teacher and learner in the general and further education and training bands will be ICT capable (that is, use ICTs confidently and creatively to help develop the skills and knowledge they need as lifelong learners to achieve personal goals and to be full participants in the global community) by 2013"* [3 p. 17].

While ICT may be the answer, even with a strategic plan on an institutional level, the questions in the mind of every lecturer were: how would I change my teaching and would it really make a difference when not all students have equal access to ICT?

This chapter sets the context in which this research occurred, through a review of the literature pertaining to the state of higher education in post-apartheid South Africa, the challenges that higher education faces through the international trends of globalisation, managerialism and massification, and the concerns regarding the impact of 'digital apartheid' on the use of ICT for teaching and learning. Consideration of the research into Blended Learning (BL) in the international arena, the rise of connectivism and 21st Century Learning Design (21CLD) and the uptake of Problem Based Learning (PBL) in health sciences education follows. This chapter then gives a detailed account of the state of BL within the University of the Witwatersrand (WITS) and the milieu within the Department of Occupational Therapy (DOT) in the time leading up to this research. The research paradigm is presented,

Participatory Action Research (PAR) as a research method is explored, and the trustworthiness and validity of this research are interrogated. The world view of the researcher is presented and the aim and objectives of this research stated.

## 1.2. The South African Higher Education Landscape

Higher education in South Africa has a complex history and faces many challenges to redress the past inequality of the Apartheid era[1,4,5]. Understanding the historical backdrop, the global and local trends in higher education and the current landscape of the South African higher education system, gives insight into the rationale for selecting a BL approach within the PBL occupational therapy curriculum within the WITS DOT.

### 1.2.1. The transition from apartheid to democracy

During the 1990's, South Africa transitioned from an elitist, minority-ruled Apartheid regime to a democratic 'rainbow nation' - a term coined by Archbishop Demond Tutu and former president Nelson Mandela[6]. This resulted in a strong focus on transformation at all levels of the education system[3,7]. The National Commission on Higher Education (NCHE)[7] published A Framework for Transformation in 1996 as a reflection of the state of higher education at the time, and to propose the first strategy towards integrating and transforming South African higher education. The Framework for Transformation highlighted the racial and gender inequalities plaguing higher education[7]. The higher education landscape in 1994 consisted of 21 universities (delivering professional degree programs and research units[1]), 15 technikons (offering industry focused technical training and diplomas[1]) and numerous single vocation colleges primarily focused on nursing, teacher training and agriculture[1,7,8]. These institutions were racially designated into the now Historically White Institutions (HWIs), which precluded the enrolment of African students without state approval[2], and Historically Black Institutions (HBIs) which were poorly resourced and tended to be rurally dispersed in African homelands[7-9].

Student higher education participation rates at the end of the Apartheid era indicated that 69.7% of white young adults (20 to 24 years old) were enrolled in higher education courses compared to 40.4% of Indian, 13.0% of coloured and a mere 12.1% of African young adults[7]. While student gender seemed more balanced, the inequalities were reflected in the nature of the chosen courses; humanities was predominantly selected by female students and sciences predominantly by males[5,7]. Similarly, the majority (87%) of university and technikon full-time academic staff were white and 68% were male[7]. The student to staff ratios at historically black universities were almost double that of historically white universities, while

historically black and white technikons had similar student to staff ratios[7]. The governance structures of higher education were deemed fragmented, and the funding models applied across institutions favoured historically white universities[1,7,9]. As a result of the educational legacies of Apartheid South Africa, the new democratic government received a broken higher education system.

In response to 'A Framework for Transformation'[7], the Department of Education issued Education White Paper 3: A Programme for Higher Education Transformation[5] as a guide to drive the process of change. Transformation in the context of South African higher education was mandated to focus on three key areas: a) access to quality education and improving the participation rates of all races and minority groupings; b) design of socially and economically responsive curricula to close the skills gap and produce sought-after, highly skilled and employable graduates; and c) an integrated and unified governance structure that facilitates partnerships between higher education institutions, government and corporate enterprise, while working to eradicate discrimination and racism and uphold the constitution. White Paper 3 was swiftly enforced by the passing of Act 101 of 1997: The Higher Education Act[10] which passed into law the requirement for all South African higher education institutions to comply with the processes of achieving transformation and unifying the higher education system.

In 2003, the Ministry of Education issued Higher Education Restructuring and Transformation: Guidelines for Mergers and Incorporations[11], to address "Objective 16: Restructuring the institutional landscape of higher education" of the National Plan for Higher Education in South Africa[12]. This started the process of merging selected universities with nearby technikons and vocational colleges to reduce program overlaps, promote regional collaboration, be responsive to regional and national needs, strengthen financial and leadership capacity, and refocus institutional culture[11,12]. Many HBIs were merged with HWIs between 2002 and 2005, culminating in 22 public sector contact-tuition universities and a single distance-tuition university across the country[1,12]. Technikons were integrated into the university framework as 'universities of technology'[1]. WITS was one of the few institutions to avoid the merger process, but was required to align with the objectives set out in the National Plan for Higher Education in South Africa[11,12].

The Council on Higher Education (CHE)[13], a statutory body, was established in terms of Act 101 of 1997: The Higher Education Act[10], with the mandate to report on the state of higher education (both locally and internationally), advise on higher education policy development, and hold executive responsibility for quality promotion and quality assurance[10,13]. Higher education in South Africa has been scrutinised over the last two decades through the work of

the CHE[1]. While great strides have been made in transformation within higher education in South Africa, there are ongoing areas of concern such as the impact of globalisation, managerialism, massification and 'digital apartheid' as experienced by South African students.

## 1.2.2. Globalisation, managerialism and massification

Higher education the world over has reported the shift towards globalisation, managerialism and massification in the early 21st century. It is thus important to explore the impact of these trends on higher education in general, and specifically during the transformation agenda in South Africa.

### *1.2.2.1. Globalisation*

Globalisation is a multi-faceted concept that hinges on growing and enabling communication and collaboration across borders and continents through advances in networked technology[1,14-16]. A key driver of globalisation is economic development and opportunity, evidenced by the internationalisation of business, trade and finance[15,16]. The economic strength and competitiveness of a country is influenced by the ability to participate and contribute to the global market, which nudges the socio-political agenda towards acceptance and compliance to global business standards and norms[17]. In South Africa the influence of globalisation on the country's fiscal policies was marked by the political shift from the Reconstruction and Development Programme (RDP) to the Growth, Employment and Redistribution (GEAR)[18] macroeconomic strategy of 2005, and more recently the National Development Plan (NDP)[19]. Interlaced in the socio-political shifts are, in many instances, a loss of cultural identity[15]; for example, in order to host an international office of a large corporation with multi-national employees, the host nation must adopt a somewhat homogeneous cultural tone with a universal language (often English)[15,20].

For higher education, globalisation has turned knowledge construction and skills development into a commodity[1,16,17,20]. Information and communication technologies and the adoption of English have become the medium of brokering this commodity on the 'global knowledge economy', resulting in internationalisation of higher education, South Africa included[4,17,21]. Through the 'Language Policy Framework for South African Higher Education'[22] the primary language of instruction for South African higher education has become English, despite there being eleven official languages in the country. Universities across continents have developed programmes for collaboration on projects and sharing of data to enhance their research agenda[1]. The teaching and learning activities and curricula have become regulated by international standards in order to be attractive to the international

markets[20]. As with any commodity, there are two crucial factors to consider: management and production. Higher education the world over has thus experienced the impacts of managerialism and massification.

#### *1.2.2.2. Managerialism*

Managerialism is the global trend of the restructuring of higher education institutions from collegial undertakings to business-like enterprises[23,24] characterised by a management hierarchy, performance targets and review, decentralised budgets, third-party revenue streams and outsourcing[24]. The Higher Education Act 101 of 1997[10] imposed a strong managerialism approach on public and private institutions by mandating a uniform managerial structure, regulating quality assurance through independent assessors and bodies, and requiring ministerial approval of institutional statutes. It can be argued that autonomy and academic freedom have been stripped from the academics doing the teaching and research, as decision-making power now resides within external regulatory entities which are likely influenced by political and economic agendas[16,23,25]. Managerial responsibilities have been decentralised to middle-management at teaching department level, severely impacting the workload of academic staff[23,26]. Professors and department heads now spend much, if not most, of their days performing managerial and committee responsibilities rather than imparting knowledge through teaching and research, thus distracting prime human capital from the core business of the university. Davis et al[25] investigated the impact of managerialism on the work strategy of academic and non-academic middle-managers at a South African university. They found an overall feeling of disempowerment due to the bureaucratic structures that often seem to constrain their productivity and limit innovative thinking through a drive towards conformity.

On the other hand, managerialism has intended positive outcomes in reducing government expenditure, standardising qualifications across institutions and facilitating transformation of South African higher education[1]. Students are viewed as paying clients[14] who have a say in the services they receive, and should thus be able to move from one university to another, choose one profession over another and demand change when dissatisfied, as seen in the recent #FeesMustFall protests in South Africa[27]. Degrees offered at a university are designed to be marketable locally and internationally, and as Adams[16] points out, it is the externally-accredited programmes that attract funding. The overriding premise of managerialism is the offering of high quality education at the lowest possible cost to students[28]. In South Africa, it is a platform for transformation, in that by improving the management and administration efficiencies, accessing third-party revenue, complying with a well-defined set of rules and standards that are independently accredited and audited, higher education should be able to offer equivalent training to larger numbers of students[5].

#### 1.2.2.3. Massification

Another global trend is massification, or the increased pressure for universities to accept larger numbers of students to ensure increased higher education participation rates for the youth of a country[1,29]. The assumption is that an educated nation builds the economy[1,29]; but in South Africa massification also forms a critical part of the transformation agenda[2,27]. The world over, massification is characterised by making higher education more accessible and affordable[29], with countries like Korea having a 98% participation rate[4]. This results in increased class sizes[24,30] and greater diversity within the student population in terms of socio-economic background, home language and level of academic readiness[29,31]. Many governments have reduced their contribution to higher education funding[29,30], and increased student numbers places a financial burden on higher education institutions[24]. Massification has impacted the ratio of students to academic staff member by not increasing the lecturer numbers proportionately[29]. There is thus a legitimate concern that in larger classes the quality of learning suffers[29,32] as students are less engaged with the learning process[29]. In order to cope with the teaching load and maintain the standards of the curricula, higher education institutions have been forced to rethink the focus and delivery of the curricula[29,33]. The impact of massification holds true for the South African context.

The rise of managerialism is largely in response to both globalisation and massification trends in higher education[1]. The 2004, White Paper on e-Education[3] proposed the development of ICT infrastructure to all South African schools and education institutions, the integration of ICT into the administration support, and e-learning into teaching and learning. This was reinforced in the 2016 CHE report on 'South African higher education reviewed: Two decades of democracy'[1] as a way to tackle the challenges of transformation and democratisation in the face of globalisation and massification.

### 1.2.3. Recent developments in the South African higher education landscape

By 2015, there were 26 public higher education institutions in South Africa, with 985 212 students enrolled, over 16 000 more than the previous year and over 92 000 more than in 2010[34].The higher education institutions are currently divided into three categories: eleven are considered to be 'traditional universities' (offering a range of professional studies at all levels of qualification), nine are 'comprehensive universities' (offering vocational and professional qualifications) and six are 'universities of technology' (offering diploma and undergraduate - degree qualifications in mostly, but not limited to, the technical fields)[35]. Three new comprehensive universities were established between 2010 and 2015[35]. There were also 127 private higher education institutions in South Africa, accommodating 147 210 students in 2015[34]. The undergraduate occupational therapy Bachelor's degree is offered at

seven of the traditional universities and one comprehensive university[36], and it is not offered at any of the universities of technology or private higher education institutions.

The quality of the higher education system of a country is measured on two key criteria; the level of knowledge acquisition and production, and the participation-attrition rates[4,37]. These criteria are benchmarked against international higher education environments in order to understand the strengths and weaknesses of a local system[1,4,37].

#### *1.2.3.1. A medium knowledge-producing country*

South Africa is considered to be a medium knowledge-producing country[4], based on the number of publications in accredited and indexed journals, the number of higher degree graduates produced, and the rankings of the universities in the country on global ranking lists such as the Times Higher Education World Rankings for each year[38].

Publication in accredited and indexed journals represents the centre-stage for participating in the global knowledge economy, which impacts competitive and innovative attractiveness on the global market, and the ability to boost the local economy[1]. South Africa has consistently been the highest research publication producing country on the African continent over the last two decades, but the lead margin is narrowing each year, despite the increase in research output[1,4]. For purposes of Government subsidy funding to universities, research output is measured in units as specified in the 2003, Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions[39]. Each publication in an accredited journal receives a single unit, which is then distributed according to the number of authors and collaborating institutions[39]. South Africa's research output units associated with journal publications was 7638.17 in 2008[40] and has almost doubled to 13959.64 in the 2015 cycle[35]. Book chapters and conference proceedings provide additional units towards research output[39]. The 'Health Professions and Related Clinical Sciences' contributed the highest research output across the sectors at 16% of the total research output in 2015[35].

Graduating students with higher degrees is vital in building professional skills capital and in addressing the scarce skills deficits faced by South Africa[1,5,41]. The South African higher education system, through the National Research Foundation, supports funding of higher degree research by awarding grants, scholarships and bursaries[1,37,42,43]. The last decade has shown gradual increases in the number of Masters and Doctoral degrees awarded in the early part, and sharp increases in the later half; i.e. 2005 to 2010 saw a 7.4% increase in the Masters degrees[44] and there was a 38.5% increase between 2010 and 2015[35]. Awarding of Doctoral degrees saw a 19.7% increase between 2005 and 2010[44], compared to the vast

increase of 77.8% between 2010 and 2015[35], resulting in doubling of the 2005 output of doctorates by 2015 (from 1189 to 2530)[35,44].

In South Africa, the major contribution to knowledge is by the traditional universities (78%)[1]. Table 1.1 summarises the contribution of the top five South African Universities[35,38,45], of which four are traditional universities and one is a comprehensive university[35]. On the Times Higher Education World Rankings (THEW), WITS was the second highest ranked of the South African institutions for 2018, trailing the University of Cape Town[38]. During 2016, WITS and the University of Cape Town both ranked equally within the 201-300 range on the Academic Ranking of World Universities (ARWU), but the University of Cape Town slipped to the 301-400 range in the 2017 ranking[45]. With Stellenbosch University, these form the top three knowledge producing universities on the African continent[38,45].

*Table 1.1 South Africa's top five universities compared*

| THEW Rank 2018[38] | ARWU Rank 2017[44] | Name of Institution | FTE* student number[38] | FTE* students / staff[38] | Publications / academic staff 2015[35] | International student %[38] | Female:Male Ratio[38] |
|---|---|---|---|---|---|---|---|
| 171 | 301-400 | University of Cape Town | 20 775 | 11.7 | 1.40 | 18% | 53:47 |
| 251–300 | 201-300 | University of the Witwatersrand | 25 342 | 24.6 | 1.36 | 8% | 56:44 |
| 351–400 | 401-500 | Stellenbosch University | 23 207 | 26.1 | 1.32 | 8% | 54:46 |
| 401–500 | 401-500 | University of KwaZulu-Natal | 32 023 | 25.3 | 1.31 | 5% | 59:42 |
| 601–800 | 401-500 | University of Johannesburg | 28 122 | 27.4 | 1.16 | 7% | 55:45 |

*FTE: Full Time Equivalent (The full-time student numbers + a consolidation of part-time student numbers to what the full-time number would be)

### *1.2.3.2. Participation, throughput and attrition rates*

Despite South African universities claiming the top ranks for knowledge production on the African continent[4,35,38] and being a middle-income country in the global economy[4], the country still displays a developing world profile when consideration is given to the participation rates of youth in higher education, and student throughput and attrition rates[4].

Participation rates are determined according to the percentage of the country's population within the five-year age range from official secondary school leaving age (population number for ages 20- to 24-years are used in South Africa), who are enrolled in higher education institutions[4,44,46]. It is expressed as a percentage of the total student numbers at any level of higher education, over the country's population in that age range[4,44,46]. Developed, high-income countries have typically boasted participation rates that averaged 74% in 2014[47], and reached as high as 114% in the case of Greece (assumingly many of the population over 24-years were also enrolled), 94% in the Republic of Korea, and 90% in Australia[46,47]. At the

other end of the spectrum, Sub-Saharan Africa has an average of 9% participation[46,47], near the average of 8% for low-income countries[47]. The best performing Sub-Saharan African countries in terms of participation rates in 2014 were Mauritius (39%), Botswana (25%), Cape Verde (23%) and South Africa the fourth highest with 19%[46]. In the last decade participation rates in South Africa have gradually increased from 16% in 2005[44] to 19% in 2015[35], yet far more of the same target population of 20-24 year-olds (31.2% in 2016) remain unemployed and not enrolled in any form of education[48]. Notably, 34.7% of South Africans over the age of 25 had failed to complete their secondary education by 2015[46], contributing to the rising unemployment rate from 22.5% in 2007 to 27.3% in 2017[48] and placing pressure on the socio-economic development of the country[1].

Student ability to attain a qualification is determined by considering the throughput rate (students completing the degree in regulation time or requiring additional years to complete the qualification) and attrition rate (students failing to complete the qualification)[1,35]. In South Africa, students entering undergraduate higher education in 2010 had a 31% regulation time throughput (e.g. 4 years for a 4-year degree), with 17% taking an additional year, and 8% requiring two additional years to complete their qualification[35]. This is up from 24% regulation time success in the 2005 undergraduate cohort, with 13% taking an additional year, and 6% requiring two additional years[40]. Of the 2005 undergraduate cohort, 34% had dropped out during the regulation time and 23% had yet to complete after two additional years of study[40]. Of the 2010 undergraduate cohort, 29% dropped out during the regulation time and 15% had yet to graduate after two additional years[35]. While this is an improvement in the throughput and attrition statistics, there is considerable burden on the higher education resources with up to 40% of the 2010 undergraduate intake requiring additional years to qualify, if they ever do.

When considering four-year degrees at contact institutions, of which the Bachelor of Sciences in Occupational Therapy is one, the regulation time throughput has a better outlook than other undergraduate qualifications. The 2010 four-year course cohort had a regulation time throughput of 44%, with a 35% attrition rate[35]. This is an improvement from the 2007 four-year course cohort, which had a 38% regulation time throughput rate and a 42% attrition rate[40]. Unfortunately, this leaves 20% of the 2010 four-year undergraduate cohort repeating one or more years of study or dropping out after the regulation time. Repeating students increase the class sizes, typically require additional support, place pressure on the student:staff ratios[1], and influence the quality of education delivered[49,50].

With the improvements over the last decade in participation and throughput rates and a drop in the attrition rate, it is important to revisit the transformation agenda instituted in 1997[5,7,10] to establish the extent of progress that has been achieved at WITS over the last two decades.

### *1.2.3.3. Transformation at WITS*

One of the primary targets of the national transformation agenda was the improvement of the participation rates and equal access of eligible students to quality higher education for all races and minority groupings[5,10]. At WITS, the Full Time Equivalent (FTE) student number for undergraduate degrees has steadily increased throughout the six years of this research as can be seen in Figure 1.1 which drew the data from the last six Department of Higher Education and Training reports on Statistics on Post-School Education and Training in South Africa[34,51-55]

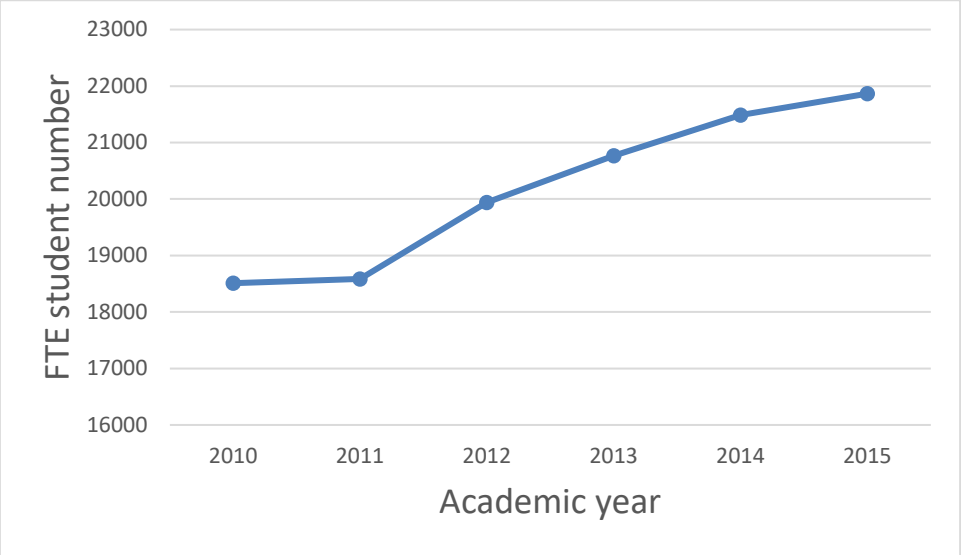



*Figure 1.1 The FTE enrolment of students at Wits 2010-2015[34,51-55]*

While WITS is clearly contributing to the national drive to improve participation rates by providing more student access to studying at WITS, consideration should also be given to how repeating students mentioned in 1.2.3.2 above have contributed to the student numbers. A closer look at these repeating students reveals the racial and socio-economic divides that still plague the higher education landscape despite the transformation agenda.

The success rate represents the course “pass-rate” (the percentage of students enrolled in all courses who pass)[34], and while a student may pass some courses in a year, failing any single course contributes negatively to the throughput rate of that degree as the student will usually have to repeat the failed course before proceeding to the next year of study. Figure 1.2 illustrates the continued gap between the success rates of African students studying at WITS and their white counterparts, with the coloured and Indian students faring in between.

The data for Figure 1.2 were drawn from the last six Department of Higher Education and Training reports on Statistics on Post-School Education and Training in South Africa[34,51-55].

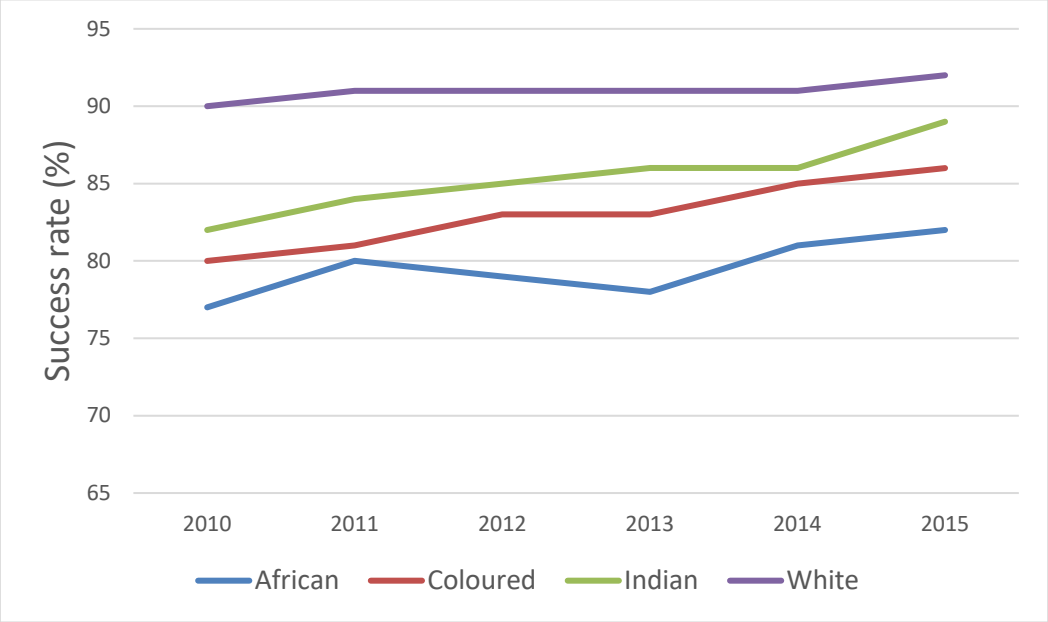



*Figure 1.2 Student success-rates at WITS by race 2010-2015[34,51-55]*

One must bear in mind that these success rates are across all years of study and against a backdrop of a majority African student body[34]. The WITS student demographics have shown that across all years consistently 4% are coloured students and 13-14% are Indian/Asian students from 2010 to 2015[34,51-55]. In line with transformation, the African student proportion has increased from 57% to 60%, while the White student proportion has decreased from 26% to 22% over the same six years (Figure 1.3)[34,51-55]. Thus, the largest of the student population racial groups presents with the lowest success rates, leading to concern that simply accepting more African students is not enough to redress the past inequality.

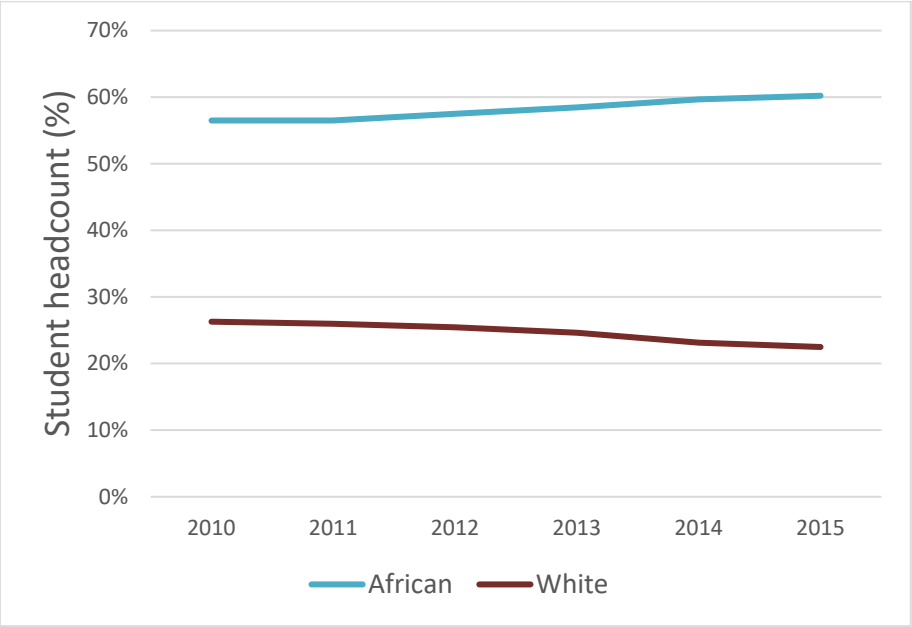



*Figure 1.3 Percentage of WITS student body headcount by race 2010-2015*[34,51-55]

In terms of academic staff, WITS has worked hard to improve the proportion of African academic permanent staff by approximately 2% per year from 30% in 2010 to 40% in 2015. The gender representation has remained relatively consistent at 47%-48% female[34,51-55] across the same period. On the other hand, WITS has fared well against the national averages which saw only 28.6% African permanent academics in 2010, with a slow rate of increase to 34.9% by 2015[35]. Despite graduating a majority African cohort of students across all degrees[35], WITS has failed to recruit the same proportion of African academics. The lack of a culturally balanced academy creates a paucity of role models for those aspiring to become academics, and many students fail to even consider academia as a career option[30].

In the past two years, WITS has adopted an accelerated transformation plan[56,57]. This eight-pronged approach has strategically focused on creating a diversified academy; the insourcing of service staff; renaming of institutional buildings and landmarks; decolonising and reforming the curriculum; an amended language policy; addressing the institutional culture of segregation, intolerance and gender-based violence; building a cosmopolitan residence life; and above all facilitating optimal access to WITS through student funding, first-year experience support, repeat-course opportunities and feeding schemes[56,57].

> *"It is necessary to remain cognisant of the constraints and trade-offs involved in driving a transformation agenda. Any initiative must be compatible with the University's fundamental mandate to be a globally competitive, research intensive institution that is responsive to local development imperatives. It must also be cognisant of the University's finances and should not jeopardise the fiscal health of the institution."*
> *Professor Adam Habib, Vice Chancellor*[56 .p. 10]

### 1.2.4. Conclusion to the state of higher education in South Africa

Two decades after the fall of Apartheid in South Africa, the higher education landscape still suffers numerous legacy issues, yet has demonstrated success and strengthening along the way.

There remains continued political pressure for South Africa to be globally competitive in the knowledge economy[5,27,49]. There is an imperative to increase participation and throughput rates, particularly of previously disadvantaged groups[5]; this, despite high student:academic staff ratios which have worsened due to a disproportionate influx of students without substantive increases in staff appointments[1,42]. While the National Student Financial Aid Scheme has increased by just under R2-billion in six years[35], providing access for more students, government expenditure on higher education has been in steady decline[1,30,49]. Lower subsidies have forced higher education institutions into competing for third-stream income[1,27] in order to offset static student fee income resulting from the #FeesMustFall demonstrations[27,42]. Universities are thus expected to produce employable graduates to build the economy with fewer resources each year[42].

Despite these challenges, the unification of governance of higher education has led to the development of policies and acts to strengthen higher education in South Africa[1,10]. Establishing the National Qualifications Framework and the CHE as an independent regulating body have ensured the quality of education delivered at higher education institutions[10]. The transformation of higher education may have a long way to go, but the statistics show increased access for students from low socio-economic backgrounds, increased number of African academics[35] and institutional policies to democratise and decolonise higher education[30,56]. Democratisation is ensuring that all students have equal opportunity for successful participation, while decolonisation is a curriculum reform process "to structure the balance between local responsiveness and global competitiveness in the curriculum" according the WITS Vice Chancellor Prof Adam Habib[56 p. 11].

At WITS, e-learning has been seen as a leading strategy towards curriculum reform in terms of both decolonised content delivery and improving the success rates of students with socio-economic barriers[57]. In light of this, it is equally important to ensure that such students are not further marginalised by increasing the technology dependence of the curriculum, and that one does not introduce greater levels of 'digital apartheid' into the student body.

## 1.3. Digital apartheid

The 2004 'White Paper on e-Education: Transforming Learning and Teaching through Information and Communication Technologies (ICTs)'[3] introduced e-education as a strategy towards improving the quality of teaching and learning at all levels of the education system by driving a BL approach. The DOT recognised the potential of this strategy, making it central to discussions during the 2008 internal audit (refer to 1.5 pg. 31). The White Paper gives the following description of learning through ICTs, effectively introducing the concept of BL:

> *"Learning through the use of ICTs is arguably one of the most powerful means of supporting learners to achieve the nationally-stated curriculum goals. It must however be very thoughtfully selected and integrated into educational planning and management. In particular, the use of ICTs for learning encourages:*
>
> - *learner-centred learning;*
> - *active, exploratory, inquiry-based learning;*
> - *collaborative work among learners and teachers; and*
> - *creativity, analytical skills, critical thinking and informed decision-making."* [3 p. 19]

The White Paper further recognised the challenges of implementing this e-education strategy due to inequitable distribution of ICT resources and human capital, highlighting the risk of social and economic exclusion for those without access to the technology[3]. The greatest threat to adopting BL within South African higher education is the inequality that arises from 'digital apartheid'[31,58]. General Colin Powell first used the term 'digital apartheid' to promote awareness of the impact that exclusion from digital and technology advancement can have on the socio-economic development of some communities[59]. Brown and Czerniewicz[60] assert that the term 'digital apartheid' is more apt to the South African context than the more popularised phrase of 'digital divide', and they introduce the concept of the 'digital stranger' rather than the 'digital native'-'digital immigrant' continuum. In this section, the concept of 'digital apartheid' is explored, the circumstances that lead to and exacerbate 'digital apartheid' are considered, and strategies towards 'digital democracy' reviewed.

'Digital apartheid' is the degree to which students experience barriers to engaging in digital activity which places the students at a learning and achievement disadvantage when compared to peers who have digital affordances supporting their learning[60,61]. 'Digital apartheid' is not binary in nature, as would be inferred with the concept of the 'digital divide' being between those who have access to the internet and use it versus those who do not have access and thus do not engage in digital activity[62,63]. 'Digital apartheid' is a multifaceted

construct, where a student's proficiency and digital readiness to engage in technology-enhanced learning activity is dependent on multiple dimensions[60,61,63,64]. The intentional act of 'digital redlining' through political and enterprise policies and practice[65] has led to the perpetuation of an 'apartheid designed' education system[66].

'Digital redlining' is the intentional exclusion of certain communities from advancements in technology through implementing policies that obstruct access or fail to deliver services to certain communities. In the context of higher education, Gilliard[67] defines 'digital redlining' as: "a set of education policies, investment decisions, and IT practices that actively create and maintain class boundaries through strictures that discriminate against specific groups." He concludes that "digital redlining takes place when policymakers and designers make conscious choices about what kinds of tech[nology] and education are 'good enough' for certain populations, but also happens through the failure to interrogate policy and design." Political complacency has perpetuated the apartheid era 'digital redlining' in South Africa by failing to meet the 2013 goals of the 2004 White Paper on e-Education[3,66].

Three dimensions have emerged as being fundamental to the inequality of 'digital apartheid' in the context of South African higher education.

### 1.3.1. The material dimension

An early concern among the lecturers of the DOT, when this research was initiated, was whether all students would have equal access to the Virtual Learning Environment (VLE), as poorer students were unlikely to have computers and mobile devices of their own, with access to the internet being restricted to when they were on campus. This concern is well supported in government documents such as the White Paper on e-Education[3], and the Draft Policy Framework for the Provision of Distance Education in South African Universities[21]. The material dimension does not simply reflect the economic resources of the students, but also considers the resources made available to their community.

#### *1.3.1.1. Infrastructure*

Firstly, consideration should be given to infrastructure, in which electricity supply and broadband coverage have primary impact on 'digital apartheid'[61,62,68]. In South Africa in 2007 only 58% of the rural population had household electricity supply, which rose to 71.5% by 2014, but lags the urban penetration of between 91% and 96% over the same time-frame[48]. Of concern is the less documented access to electricity in the peri-urban Apartheid-era township areas, where housing now ranges from the mansions of Soweto's Diepkloof extension 1[69], to the 13% of the population living in informal settlement housing[70]. Pritchard

and Vines[68] highlight that many households in peri-urban areas do not have direct electricity connection, and that often electricity is a shared commodity. By 2015, 3.9% of the country's primary and secondary public schools remained without electricity while a further 12.1% were hampered by unreliable electricity supply[71]. Electricity is needed to charge/power the electronic devices that facilitate access to the internet (mobile devices, laptops and desktop computers) if digital literacy for all levels of education is to be achieved[61,68].

Broadband coverage is far from ubiquitous in South Africa[72]. According to The Broadband Commission for Digital Development Report [73] , in 2015 only 37.3% of South African households had internet access, and a mere 3.2% of the population subscribed to a fixed line broadband service. Rural areas are less likely to have broadband access than urban areas[74]. While many students do not have access to the internet at home, Oyedemi[64] suggests that students make use of internet cafés or the free wireless access available at some restaurants and coffee shops. The distribution of these wireless hotspots are clustered in the urban centres and are thus less accessible to those living in peri-urban and rural environments[74]. The White Paper on e-Education mandated that by 2013 all government institutions at all levels of the education system would have access to the internet for teaching and learning purposes[3], yet by 2015 only 19.5% of government primary and secondary schools had internet connectivity for teaching and learning activities, and a mere 32.2% have a computer centre (connected to the network or offline) for developing digital literacy skills[71]. This marked lack of progress in addressing the inequity of access to the internet is considered a form of 'digital redlining'[67].

Not only is the availability of both of these infrastructure resources a concern, but the 'digital redlining' is exacerbated by the costs incurred to make use of the infrastructure. The cost of electricity was seen as a challenge to accessing electricity by 16.1% of Gauteng households[70]. Goldstuck[75] asserts that the fundamental factor impacting internet access in South Africa is affordability. South Africa has comparatively high costs of mobile data when compared to other African countries[72,75], at almost six times more expensive than Tanzania, the cheapest in 2016[76]. Perversely, the factor that exacerbates the cost issue is that the cost per Gigabyte (GB) decreases when buying larger data bundles, making it cheaper for those who can afford to buy more data in a single purchase, thus advantaging the rich[75]. Similarly, those with access to higher incomes are able to afford mobile data contracts[75] and fixed line or fibre broadband to their homes, thus offsetting their overall expenditure and accessing unlimited broadband at high speed.

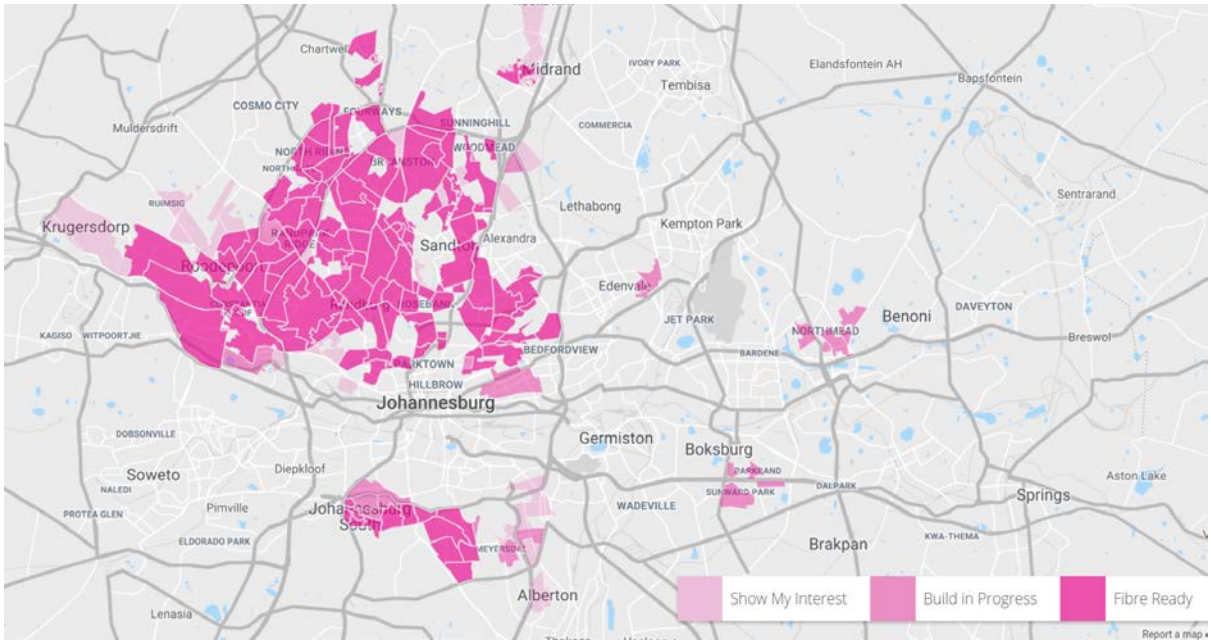



*Figure 1.4 VUMA rollout in Johannesburg as at April 2018*[77]

The rollout of South Africa's primary provider of fixed line high-speed fibre (VUMA[78]) demonstrates the concerns highlighted by Cornish[65], with the deployment of fibre by AT&T in 2002 and later Google fibre in 2010. Figure 1.4 shows the fibre-ready status of the affluent Northern suburbs of Johannesburg with the exclusion of SOWETO, Alexandria and the inner city of Johannesburg[77]. By requiring suburbs to show their interest in fibre before an area is considered for fibre delivery, the community needs enough people with internet access to go onto the VUMA site[78]. This is limiting to those communities who most need the highspeed, cheaper access. This form of 'digital redlining' advantages those who already have access, and targets areas that are more likely to subscribe to the higher packages[65], leaving the lower socio-economic communities with only mobile data as a form of access. Students from lower socio-economic communities are often restricted to buying pre-paid data in small bundles, which is the most expensive way to access the internet, and fundamentally limits their access to educational resources and their VLEs[75].

> *"It highlights the extent to which lower income South Africans are frozen out of the Internet economy." Goldstuck*[75 p. 3]

### 1.3.1.2. Hardware and software

Secondly, 'digital apartheid' is influenced by students' ownership and access to computing device hardware and software[62]. Computing devices include desktop computers, laptops, tablet computing devices (TCDs) and mobile phones. Mobile phone ownership in 2011 stood at 84.2% of South Africans over the age of 15 years, with 51% of the devices considered to

be smartphones (devices capable of accessing the internet)[79]. At that time a mere 29.1% of South Africans 15 years and older had access to a computer or laptop[79]. Brown and Czerniewicz[60] found that in 2010, 57% of students from low socio-economic backgrounds had no access to a computer off-campus as compared to only 25% from average socio-economic backgrounds, and 18% from high socio-economic backgrounds. Students will often prioritise the ownership of a mobile device that is capable of accessing the internet and social media, resulting in near ubiquitous ownership[60,61]. With the rapid advancements in technology it is not simply an issue of having a mobile device or computer, but the age of the device impacts the nature of what the device can be used for. Older computing devices have less processing speed and smaller Random-Access Memory (RAM) capacity, which influences the type of software that can be installed, the speed at which content from the internet can be accessed and downloaded (if the device can access the internet at all), and the amount of data the device can work with at a time. Students who have managed to buy second hand devices may thus still be disadvantaged relative to the student who owns a device currently on the market[60].

Similarly, the software or applications loaded on a computing device influence the manner in which the device can be used for learning[62,80,81]. While the cost of software licences and mobile applications is often discounted for students, it still may present an unanticipated or unaffordable expense, prompting students to resort to similar cheaper licences or online tools[80,82]. The rise of cloud technology has facilitated the development of online software and document repositories which are presented as ‘free’ for the student, but incur licence fees for the higher education institution and place a costly bandwidth burden on the institution[82]. Students can access this cloud software on campus, but incur the data costs as soon as they access from off-campus[82]. Franklin[82] argues that computing devices are going to become dependent on cloud computing, even for their operating system to function. This can already be seen in the Google Chrome-book, placing greater pressure on institutional bandwidth[83]. Most software has a regular update requirement, which is a concern when internet access is limited and costly, resulting in computing device owners blocking software and application updates. Students may not be able to download the same content or produce the same level of content within the older/cheaper software or application as their counterparts who can afford the most recent versions and regularly update the software and applications on their computing devices[80,81].

Students who have the material support at home are afforded unlimited access to the internet, placing them at a distinct advantage of accessing learning resources online as and when needed[60,64]. Students who do not have material support are limited to accessing the internet at points that have both hardware and broadband availability, such as a campus

computer laboratory, community library, or internet café[60,64]. This places them at a disadvantage as they need to make specific arrangements to go to the chosen access point, may have to wait their turn if there are no devices free, and in a public environment their lack of digital skills may be exposed[60,64].

### 1.3.2. The skills dimension

The skills dimension considers the level of digital literacy a student has prior to entering higher education, and the social capital available to them to support their ICT skills development[60,61,68].

#### *1.3.2.1. Digital literacy*

Historical inadequacies of primary and secondary education in South Africa continue, and as such impact student exposure to ICT prior to entering higher education[61,63,66,84]. Digital literacy is the ability to use technology to find relevant information and media, analyse and integrate digital content, and construct nuanced content at a proficient skill level[83,85]. Naidoo and Raju[66] found that 66% of students who came from rural schools felt their schools were under-resourced and poorly equipped to prepare them for the digital literacy required to cope at university. This reflects the stark underperformance of the South African Department of Basic Education in meeting the 2013 goals set in the White Paper on e-Education[3], as suggested by the lack of material dimension penetration to support a digital literacy curriculum detailed in 1.3.1.1 above.

In 2010, Brown and Czerniewicz[60] coined the term ‘digital stranger’, referring to students with less than 4 years of ICT exposure, who were limited in their access to computers off-campus, and typically tested poorly on digital literacy tests[60,61]. Most of the ‘digital strangers’ were first exposed to the internet via mobile phone and did not necessarily regard the digital skills associated with mobile technology to be easily transferable to the computer environment[61]. Such students are highly dependent on the courses offered at their university to learn the digital skills required to effectively participate in their curriculum[86], but due to restricted access to computers are not able to hone these skills in their available time. While the ‘digital stranger’ may have been born in the ‘net-generation’ (after 1982)[60,61,87,88], due to the inequality that still exists in access to material resources, and poor exposure to ICT during their secondary education years, Wessels and Steenkamp[87] question whether these students have the learning styles and preferences expected from typical ‘net-generation’ students. Naidoo and Raju[66] found that students with poor digital literacy were less confident in doing online learning activities, required individual support from the technical support unit or library assistants, and lacked understanding of some of the terminology related to their digital

participation. Typical 'net-generation' students have grown up with technology at their fingertips and embedded in everyday life, and are consequently also dubbed 'digital natives'[60,61,87]. However, if it merely came down to the year one was born rather than the socio-economic and geo-political context one grew up in, then all students would have similar, well-honed digital literacy skills.

#### *1.3.2.2. Socio-cultural capital for digital literacy*

In this context, socio-cultural capital refers to the ability of the student's family and community to support the development of digital literacy skills[61,64,68]. The past two decades have seen a stark rise in first-generation students, i.e. students who are the first in their family to gain access to higher education[2,89]. Goldstuck[75] points out that only 20% of adults with grade 6 and 40% of those with grade 10 education use the internet. For many students this means that they lack the socio-cultural capital of their second-plus generation peers, whose degreed family members have a 71.6% internet experience[75]. Pritchard and Vines[68] found that due to a lack of formal ICT education in the peri-urban schools around Cape-Town, the youth could not draw on the digital expertise of families or neighbours to improve their own skills. When students experience a problem with a digital tool they often need the support of the university student services which may not be available at the time the problem occurs. Students who have grown up with technology at home are more likely to have a network of individuals with high digital literacy who can be accessed at the moment of need, thus reflecting a socio-cultural capital supportive of digital literacy[61].

### 1.3.3. The virtual dimension

The final dimension to consider is the virtual dimension. Once a student has gained a sufficient level of access to the internet and developed the necessary digital literacy to engage with the online world, the virtual dimension may be the final stumbling block. Graham[62] is one of the few authors to raise this dimension as a concern, whereas others take cursory notice[3,90]. He notes two primary elements to the virtual divide: language-culture fit and content visibility[62].

#### *1.3.3.1. The language-culture fit*

The internet delivers predominantly English-language content that is contextualised in Western-culture[62,91]. Despite the South African higher education environment being largely English-medium[1], the majority of students are not first-language English speakers[92]. Graham[62] contends that for second- or third-language English students, the way they interpret content from the internet may be influenced by their language ability, and that the time taken to understand and apply content is longer than for their first-language English

counterparts. English-language publications are rated more highly in the scientific community; thus research produced in English is more desired by the university, and published articles available to students are more likely to be in English[1]. The attempts of South African higher education to democratise the curriculum are hampered by the predominance of Westernised English-language resources available for students as learning materials, prompting the proposal in the White Paper on e-Education[3] that South Africa should focus on developing websites with high-quality content in all eleven official languages, representing the diversity of culture present in our country. Unfortunately, this plays into the content visibility concern.

#### *1.3.3.2. Content visibility*

Graham[62] highlights that due to the information explosion it is impossible for an internet user to see all information on a topic. Search engines employ visibility algorithms based on the features of the web page (such as: the frequency the search topic is mentioned on the page and appears in titles on the page; the number of topic-related hyperlinks to other content pages that appear on the page; and the frequency that the page has been accessed by other internet users) and the location and prior-use statistics of the user[93]. These algorithms sift and filter the information delivered to a user[62,93], which is a form of 'digital redlining' highlighted by Gilliard[67]. If the world at large seldom searches for a page written in one of the nine official African languages of South Africa, despite the page containing high quality information it may not even appear in the top hundred webpages listed in the search engine, and is thus less likely to be seen as students seldom look beyond the first ten results[62]. Content visibility may hamper the initiatives of the White Paper on e-Education to create culturally and contextually valuable content[3].

Together with this is a student's information retrieval skills, the ability to create the search phrase that yields the best results, how the internet is being accessed, and what has been searched for and/or accessed in the past[62,93]. If the browser in a computer laboratory does not require user-specific login, then the search engines retain the usage patterns of all users. As an example: if the majority of students in that laboratory search in English for information related to 'Business Economics', and health sciences students wish to access articles in another language related to 'Occupational Therapy', they are likely to get English articles that consider an economic aspect of occupational therapy because the algorithm assumes the user will still prefer English content that relates to business economics. Articles related directly to what the health sciences student was looking for may not be visible on the first few search pages. Students thus only see what the search engine makes immediately visible.

### 1.3.4. Conclusion to the issue of digital apartheid

'Digital apartheid' may affect all students within one or other dimension. It thus impacts the extent to which a student is disadvantaged or advantaged across all three dimensions. Figure 1.5 illustrates that while both students have some dimension affordances and barriers, student B is at a digital advantage over student A.

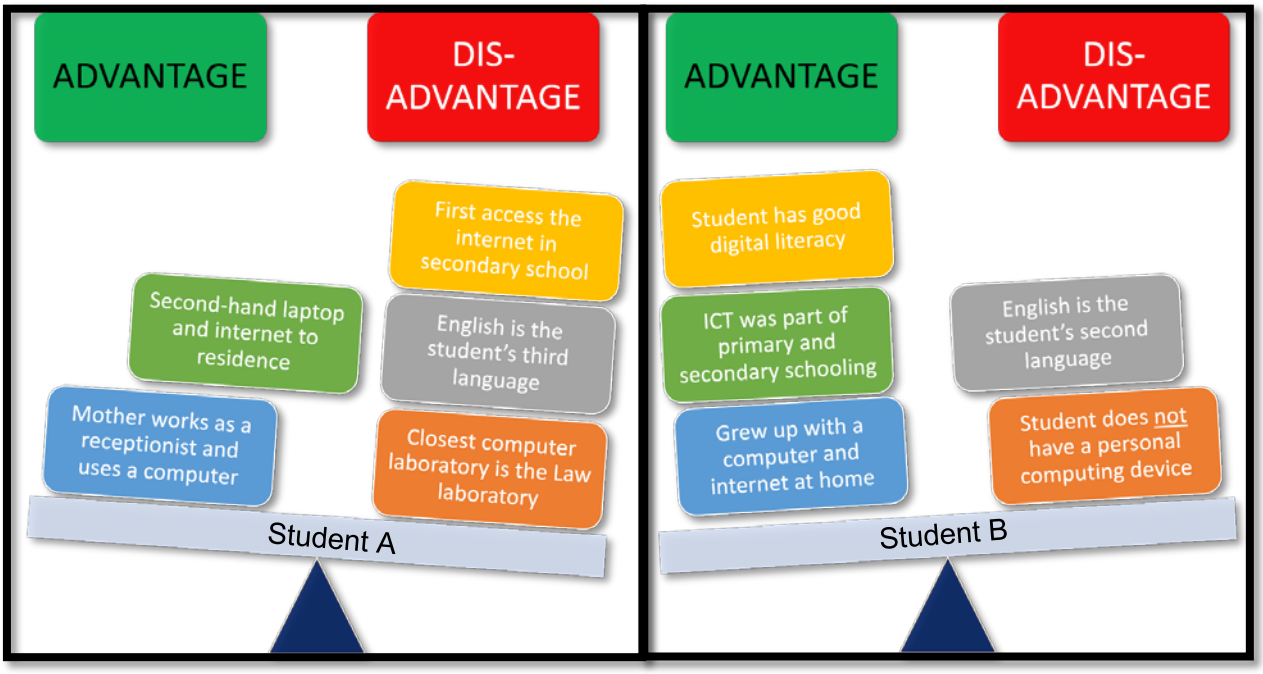



*Figure 1.5 Analysis of the 'digital apartheid' between two students*

The affordances and barriers created through 'digital apartheid', that impact a student's ability to participate, particularly in BL activities, should be established, and measures introduced to ensure equitable learning experiences for all.

## 1.4. Education theory and blended learning

The integration of BL into a curriculum is not simply adding some online resources and activities to supplement an already substantial student workload. Occupational therapy practice prides itself on being evidence based[94], and it is no different when considering the education of occupational therapy students. It is thus essential that the process of integrating BL into a curriculum is based on sound pedagogy. This section explores the education theory supporting the WITS DOT curriculum, the use of PBL in occupational therapy education, and the evidence supporting and challenging BL in a 21st Century Learning Design (21CLD).

### 1.4.1. The evolution of the constructivist paradigm

There is a lasting influence of industrialisation within our education system[50,95]. The behaviourist mandate born out of Cartesian dualism persists, where knowledge is in the mind and separate from the body[96]. Students learn what they are told, they internalise this information through reward and punishment, and the degree of learning is measured through behavioural output[90,95,96]. There is, however, compelling evidence that constructivist approaches to learning have better outcomes[96-98]. This section outlines the two dominant constructivist approaches: Cognitive-constructivism and social-constructivism[96].

> *"One of the reasons the old systems of education are not working now is that real life is not linear or standardized: it is organic, creative and diverse and always has been" Sir Ken Robinson*[95] *Kindle location 587*

#### *1.4.1.1. Cognitive-constructivism (Jean Piaget and Ernst von Glaserfeld)*

Jean Piaget was arguably the largest mid-twentieth century contributor to the constructivist paradigm with his theory of cognitive-constructivism[97,99,100]. As a biologist and developmental theorist, he studied how children learn and develop new skills[99,100]. Piaget proposed that learning does not take place simply by receiving information[96,99,100], rejecting the behaviourist paradigm[96,101]. Knowledge is constructed through meaningful experiences, with body (sensory-motor) and mind (cognitive-emotive) integrating prior schemes and knowledge into new understanding[96,99,100].

Ernst von Glaserfeld[100,102] built heavily on Piaget's work towards the end of the twentieth century with his take on cognitive-constructivism being in the form of 'Radical Constructivism'. He postulated that reality is not viewed as an absolute that can be discovered, but is dynamic and changing, based on context and situation[100-102]. In agreement with Piaget, he believed that learning takes place when we face a challenge, in our ability to adapt, and as we strive to regain our equilibrium[99,100]. Understanding is formulated through active participation rather than passive observation[101] and is reinforced through a self-generated perception of success[103]. Reality is different for everyone through adaptive cognition. It is shaped through our experiential world and reconstructed with every event[100,102-106].

The cognitive-constructivist paradigm views knowledge construction as an individual process[99,107], with learning happening at an individual pace[99], and the teacher's role is that of facilitator[103]. Knowledge is perpetually changing and reorganising within an individual[96,101,104], and as such is not truly measurable[107]. Assessment of knowledge through standardised processes and examinations is therefore an estimate of a student's ability to perform in that

moment in time based on that specific context[107]. It brings into question one's heavy reliance on the behaviourist need for measurement[96,102,107] and the ranking of students from best to worst in order to pass or fail them[95]. Individualised or personalised learning pathways are becoming popular in modern higher education in recognition of Piaget's and von Glaserfeld's contributions to education theory[97,108].

#### *1.4.1.2. Social-constructivism (John Dewey and Lev Vygotsky)*

While generally supporting Piaget's position that knowledge develops from experiencing the world, John Dewey and Lev Vygotsky rejected Piaget's and von Glaserfeld's position that it is an individual process[97,99]. They believed that learning takes place through participation and active inquiry within a social context, thus developing the core theory of social-constructivism.

In the early twentieth century, John Dewey presented his pragmatic ideals regarding how we think[109], and how learning takes place[110]. Summarised in the quote below, his social-constructivist position is clear.

> *"The development within the young of the attitudes and dispositions necessary to the continuous and progressive life of a society cannot take place by direct conveyance of beliefs, emotions, and knowledge. It takes place through the intermediary of the environment. The environment consists of the sum total of conditions which are concerned in the execution of the activity characteristic of a living being. The social environment consists of all the activities of fellow beings that are bound up in the carrying on of the activities of any one of its members. It is truly educative in its effect in the degree in which an individual shares or participates in some conjoint activity. By doing his share in the associated activity, the individual appropriates the purpose which actuates it, becomes familiar with its methods and subject matters, acquires needed skill, and is saturated with its emotional spirit." John Dewey[110 p. 22]*

Dewey considered an ecological inter-relationship between the human organism, the non-human biophysical environment and the social environment[96], as a foundation for stimulating curiosity and exploration of the unknown[111]. By doing and reflecting, learning occurs spontaniously[96,112]. Dewey focussed on the role of reflective thought through two primary avenues: firstly, perplexity, hesitance and doubt which leads to questioning; and secondly, through the purposeful investigation of new information to corroborate or nullify the accuracy and value the information holds[113]. The use of Socratic questioning leads both to answers and more questions from which to investigate further[99,113]. This aligns well with the PAR research design of this study.

Lev Vygotsky supported much of Dewey's beliefs, but focused more directly on the learning process[97,98]. Vygotsky deemed learning to be a social process, emphasising the principality of the learner by requiring the learner to be invested in the learning outcomes[98], and building on the prior knowledge of the learner[97]. Through the experiences of the group, meaning evolves[114], particularly when the learning activities have real-world context[97]. Learning is an active, learner-centred process[97], requiring the co-creation of meaningful content or product[115], while monopolising on the diversity of perspectives, experiences and cultures within the group of learners[97,99]. Vygotsky believed that language and an inner voice are a foundation for knowledge development[99,116,117]. He described the potential to learn as a space between a person's current level of development and their higher level of possible development, which he labelled the 'zone of proximal development'[118,119]. He asserted that the 'zone of proximal development' can be altered with a more advanced social influence, adapting and changing the environment or scaffolding the learning process[118-120]. Vygotsky was one of the first theorists to suggest that knowledge resides outside the self, and rather within the social community[117], forming a foundation for the emergence of Siemens'[98] theory of connectivism.

#### *1.4.1.3. Conclusion to the constructivist paradigm*

The common thread of the constructivist paradigm is that knowledge is created through meaningful participation in real-world experiences[98]. When there is confusion and puzzlement regarding the world around us, we naturally reflect, ponder, seek answers and experiment to solve real-world problems[99,121]. This forms the foundation of George Seimens'[98,116] theory of connectivism as well as the learning designs of PBL and 21CLD.

### 1.4.2. Learning theory and design for the 21st century

> *"Internet technology and renewable energies [are] about to merge to create a powerful new infrastructure for a Third Industrial Revolution (TIR) that would change the world. In the coming era, hundreds of millions of people will produce their own green energy in their homes, offices, and factories and share it with each other in an "energy internet," just like we now create and share information online. The democratization of energy will bring with it a fundamental reordering of human relationships, impacting the very way we conduct business, govern society, educate our children and engage in civic life." Jeremy Rifkin*[122 p. 2]

The first industrial revolution led society away from many generations of economy centred around agriculture, to the economic shift towards factory based production and migration towards urbanisation[123,124]. This era saw the rise of the mass public schooling system,

educating to serve the needs of an industrial labour force[123]. The second industrial revolution was driven by the mechanisation of factories and the transition towards service industries[123,124]. This had little impact on the education systems across the world which retained the factory-style classroom[123]. The digital age marks the third industrial revolution with globalisation and the rise of the knowledge economy[91] (refer to 1.2.2.1 p. 4). McCann[91] argued that the digital age has increased the inequalities between the developing and developed economies. Blinder[123], Codrington and Grant-Marshall[88], as well as Bush and Codrington[125], agreed that education reform needs to educate for professions that do not yet exist and which may not even service the same country's economy. The last four decades have seen rapid growth in information and communications technologies[91] and the introduction of new professions[88], yet education reform remains stagnant with only a mild trend towards educating more of the population (refer to 1.2.2.3 p. 6) and an increasing focus on student performance through regular assessment[91]. Tuomi[126] asserts that retaining the education systems that served the first and second industrial revolutions poses the risk of being dysfunctional for society now and in the future. Of greater concern is the assertion by Schwab[127] that the fourth industrial revolution is upon us, evidenced by the exponential pace of technology innovation and penetration into everyday life. Education is treading water while society torpedoes into the era of nano-technology, artificial intelligence and quantum computing. It is paramount that we redesign education for the 21st century.

#### *1.4.2.1. Connectivism: a learning theory for the 21st century*

Connectivism has its foundation in a constructivist paradigm. Pioneered by George Siemens[98,108,116] and further explored and supported by Stephen Downes[128], connectivism is viewed as a learning theory for the 21st century as it harnesses the power of networked knowledge. They recognised that a new set of skills is required for learning in a world where information is rapidly expanding[90,98,128]. It is impossible for an individual to memorise and know all the information that exists in a chosen field; it thus requires an individual to have the skills of information-finding, filtering, interpreting and then applying in innovative ways to create new knowledge[97,128].

From a social-constructivist perspective, Siemens[108] asserted that knowledge does not reside within an individual or even a community, but rather within a network that is formed of nodes. These nodes may be in the form of trusted experts, curated digital and print content, tools and processes[97,108]. For example, rather than learn how to work out the correlation co-efficient between two sets of data, we simply 'offload' this knowledge task to statistical analysis software, which may even suggest to us how the results should be interpreted once the analysis is returned. In this example, knowledge resides in a non-human tool, which returns information that is then used in creating further knowledge and possible content for

others to learn from through published work. Connectivism proposes that the potential for learning resides in the quality of the personal, team and community networks[97].

From a cognitive-constructivist perspective, connectivism proposes learning as an accretion process which is contextualised within real-world issues[97,108]. Learning begins with the individual giving his/her own unique knowledge and perspectives and being open to receiving a diversity of information and perspectives from the nodes within their own personal learning network[90,98]. Connectivism requires the learner to manage the knowledge flow and nurture one's personal learning network by contributing and engaging in the ongoing debates within the chosen field[90,97,108].

Downes[128], however, argues that connectivism deviates from the constructivist paradigm in that learning is continual through all moments and any engagement with information, irrespective of whether learning is the intention of the engagement. Your choice of radio station, social events or even the route one selects on the way to work forms the information that one surrounds oneself with, and in this way informal learning takes place[90,128]. Downes[128] further postulates that the focus of constructivism is on the acquisition of knowledge concepts, where as in connectivism it is on refining, building, and diversifying one's personal learning network to engage more meaningfully and innovatively in society.

In higher education, the curriculum requires the attainment of specified learning outcomes and thus cannot rely solely on the possibility that learning may occur given the optimal network[90]. Connectivism may provide a philosophical underpinning for how the 21st century student learns, but a learning design is required that harnesses the connectivist principles in facilitating the learning process and skills development that will be relevant to an ever-advancing world of work.

#### *1.4.2.2. 21st Century Learning Design (21CLD)*

Preparing students for the world of work in the fourth industrial revolution requires the development of unique skills that allows them to adapt and succeed[129] in their portfolio of jobs rather than for a single career[125]. Much of the research in this thesis was done with net-generation students, but it is important to recognise that the iFacebook-generation (born after the year 2000) is about to enter higher education[88]. Twenty-first Century Learning Design is based on connectivism to provide lecturers with a strategy for crafting BL activities. While many skills have been proposed as being important, the most consistently cited 21st century skills are effective communication, collaboration/team-work, critical thinking, socially responsive real-world problem-solving, creativity/innovative thinking, self-regulation and the use of ICT[3,125,129,130]. Instead of teaching students the information and skills of a profession,

higher education must teach students how to learn (life-long) within a professional domain of interest, otherwise what is taught to them today may not have relevance by the time they graduate[125].

Both Irvine et al[131] and O'Connor et al[132] proposed that 21CLD be centred in a community of learners engaged in authentic learning experiences, where agency lies with the learner and the learning community. Authentic learning experiences may be facilitated through inquiry-based or problem-based learning, which in turn provides students with the opportunities to develop essential 21st century skills[131,132]. Technology is an enabler that provides the tools for communication, information seeking and organising, collaboration within the learning community and between learning communities, which assists in the problem-solving process[3,129]. Of key importance for true agency to exist, students must engage in action as an outcome of their collaborative process by participating in the real-world implementation of their response to the inquiry or problem[131,133]. It is thus proposed that 21CLD has the potential to democratise a curriculum through engagement with the significant issues of the local context by developing communities of learners in a connectivist approach.

#### *1.4.2.3. Problem Based Learning (PBL)*

Howard Barrows[134] pioneered PBL in medical and health sciences education as an approach to providing authentic, meaningful learning experiences[135-137]. Implementing PBL requires a curriculum designed around a series of scenarios/cases (problem) that are gleaned from real clinical situations[135,137]. Students work in small groups with a facilitator over a few weeks to thoroughly engage with each problem[135,137]. The PBL process is well defined:

1. The problem scenario is read and any unfamiliar terms are defined[135,137-139]
2. Students discuss the scenario offering prior knowledge and brainstorming the issues raised in the discussion[135,138,139]
3. The group reflects on the discussion and identifies the learning issues or objectives that require further investigation[135,137-139]
4. The group disbands for a period of self-study to investigate the learning issues[135,138,139]
5. The group returns for a reporting session where the resulting responses to the learning issues are presented and collaborative conclusions are drawn[135,138,139].

Jacobs[138] asserted that while most of the learning occurs through the group engagement with the problem, there may also be lecturer-led skills laboratories and tutorials to complement

the learning process. Barrows[134] proposed four primary outcomes of implementing a PBL curriculum: knowledge is structured for the clinical context; the process of problem-solving promotes the development of clinical reasoning skills; students engage in self-directed learning which promotes self-regulated learning skills and the ability to self-assess; and through authentic case scenarios students are motivated to learn as the content is immediately deemed relevant to their future practice. There is thus clear alignment between 21CLD and PBL in that the scenarios are authentic, students collaborate and communicate their prior knowledge from their unique and diverse perspectives, they are required to self-regulate their learning pace and process, and use critical thinking to solve the learning issues[132,138].

Some studies comparing PBL to traditional lecture based formats proved inconclusive in finding a significant difference in academic performance or knowledge retention; however, this is usually when small participant numbers are used[140] or PBL is presented as an isolated learning activity as opposed to within a comprehensive curriculum[141,142]. Zhou et al[143] conducted a meta-analysis of the effectiveness of PBL on knowledge scores within pharmacy curricula in China, demonstrating a pooled significant difference with students in PBL performing superiorly to those from traditional lecture formats. Gurpinar et al[144] compared the knowledge of the first group of students to reach the final year of their medical degree through PBL, to the knowledge of the last group of students to be taught via traditional lecture delivery. This more rigorous approach to considering the whole curriculum yielded a significant difference in the two public health constructs that were examined and compared[144]. Students in the PBL delivery out-performed the students in the traditional delivery curriculum[144]. These studies were conducted prior to the influx of BL into PBL.

Woltering et al[139] became concerned that their students were becoming less motivated to learn in the PBL curriculum. Concerns raised included that the students felt that the tutors were inconsistent in the facilitation between groups, paper-based scenarios were being perceived as less realistic, and that due to the vast array of resource material some students were offering very diverse responses to the learning objectives, leading to confusion and inconclusive solutions to the problem. These concerns were supported by Jay[145] and Jacobs[138] in their investigations into the students perceptions of PBL within the DOT at WITS. Of particular concern was that the high workload of self-directed study was demotivating in light of past experience with traditional lectures in many other courses. The opportunity for BL to be integrated into PBL as a way to address these concerns was suggested[138,139,145].

### 1.4.2.4. Blended Learning in Problem Based Learning

Blended Learning is the seamless integration of online and face-to-face (F2F) learning activities to achieve the learning outcomes[31,81,139,146,147]. The curriculum is artfully designed through careful consideration of how online or F2F learning activities facilitate student engagement optimally for each concept, with adequate time allocated within the program for all learning activities[146,147]. Virtual Learning Environments and web-based interfaces provide a variety of online learning tools with which to craft learning activities[24,31,81]. These tools are typically categorised into resources, synchronous communication, asynchronous communication, collaboration content creation tools and performance evaluation tools[148]. Resources comprise of validated websites, journal and media repositories, lecture notes, podcasts (audio-recorded tutorials), vodcasts (video tutorials) and demonstration videos. Synchronous communication tools facilitate real-time communication such as a chat room, Skype™ call or webinar, whereas asynchronous communication is not time-sensitive e.g. an ongoing discussion forum, Skype™ chat, or Twitter and other social media interaction[149,150]. Collaboration content creation tools allow students to work simultaneously in an online environment such as a Wiki (basic web-page that allows multiple participants to edit the page simultaneously and tracks the contribution history), online notebooks or blogs[148]. The performance evaluation tools comprise of assignment submission tools for essay, audio or video file assignments, and quiz tools which provide various types of questions (multiple choice, true/false, matching, short answer, essay, image labelling etc.) which can be implemented for either formative or summative evaluation[148].

Alammary et al[151] suggest three approaches to the integration of BL into a curriculum:

- High-impact blend: The curriculum is fully redesigned without consideration of how the curriculum was previously delivered. The course designers and lecturers require well-honed technology skills and a good understanding of pairing learning outcomes with optimal learning activities. This option is time consuming and is thus often phased in year-on-year as a cohort progresses from first year[151].

- Medium-impact blend: The curriculum is evaluated to identify which aspects of the course would be better delivered through online activities, essentially replacing some of the F2F activities. This is less time consuming but still requires good technical ability, and can be implemented simultaneously throughout a curriculum[151]

- Low-impact blend: This is the least beneficial form as it involves simply adding supportive online materials and activities over and above the existing curriculum delivery[151].

For this thesis, a medium-impact blend presented an optimal approach to integrating BL into PBL, particularly focusing on the use of multi-media for enhancing the problem scenario and providing collaborative learning opportunities during the self-study portion of the problem[139,152-154]. Wei-Chieh Wayne et al[152] compared the examination performance of students in a blended PBL course to those of a conventional PBL and those in a traditional lecture course, finding that the students in the blended PBL significantly out-performed their peers. It is, however, unclear as to how much F2F time the blended PBL group interacted with one another. Moeller et al[153] suggested that the use of a Wiki for asynchronous collaboration was viewed as a better collaboration tool than the synchronous chat. Thomas et al[154] found that students felt confident in their knowledge when able to watch videos of experts in the field at the start of a PBL module, and that they benefited from having formative online assessments to self-check their knowledge and for examination preparation. Woltering et al[139] compared the motivation and the students' subjective learning gains between a conventional PBL and a blended PBL module. The students in the blended PBL reported significantly higher motivation to learn, and perceived better knowledge gain than their conventional PBL counterparts; however, Woltering et al[139] acknowledged the possible impact of novelty at the introduction of blended activities which may diminish motivation over time. This evidence suggests that there is a place for BL within a PBL curriculum.

## 1.5. Identifying the macro-level problem

The Department of Occupational Therapy at WITS conducted an internal audit in June 2008 in order to align department policy and practice with the WITS 2010 Strategic Plan, and review the quality of the department's practice in view of the Higher Education Quality Committee audit criteria[155]. The audit revealed the following concerns:

- The impact of massification and the adherence to the Framework for Transformation[7] was resulting in higher student numbers, with greater diversity among students.
- Many students were second/third language English speakers (the curriculum is presented only in English at this University)
- Students come from varied socio-economic backgrounds, some having travelled to an urban environment for the first time when entering higher education.
- 'Digital apartheid' was of concern as some students had extensive exposure to digital media and were skilled at using various applications while others had never had the opportunity to use a computer or a smartphone.
- The number of University funded posts for lecturers in the DOT was not increasing despite higher undergraduate student numbers, resulting in a growing concern that

attention to research and postgraduate teaching was being compromised and more of the workload was being diverted to the undergraduate programme.

- Lecturers were frustrated at not being able to engage in their own academic development such as pursuing higher degrees and obtaining research rating by the National Research Foundation[43].
- The burden of administrative tasks was viewed as having an unnecessary impact on the 'real work' and this burden was increasing with the larger student numbers.
- Publication output of the DOT was suffering with an average of only 2.4 DOT papers published per year in accredited journals over the prior decade (refer to 6.2 p. 81). Poor rate of publication compromises staff career pathing and departmental funding through the Government subsidies received for accredited journal publication.
- The throughput rate of students was highlighted as an issue as many students repeat at least one course during the four-year degree, resulting in five or more years of study.
- Additional years of study are an additional financial burden for the students, and bursary funding is often withheld or withdrawn for repeating students.
- The DOT does not receive full government subsidy for repeating students, thus impacting on the financial resources of the DOT.

One of the strategies for addressing several of these concerns was the inclusion of e-learning into the delivery of the undergraduate curriculum. Consequently, at the start of the 2009 academic year, the WITS VLE was used to create a course for each class, with the idea of adopting a BL approach to the PBL curriculum.

Though the implementation of BL should ideally be through redesigning the curriculum as a whole, this was not possible due to time and resource constraints. The DOT had already undertaken a major undergraduate curriculum redesign in 1993 by adopting a hybrid of the PBL approach to curriculum delivery and forgoing most of the traditional lecture based delivery[145,156]. The latter curriculum was evaluated by the Health Professions Council of South Africa in 2004 and found to be of good standard, albeit with some recommendations for improvement. A minor curriculum change was instituted in 2005 which involved the programme becoming modular in nature. The modular program involved classes being divided into two groups with alternating learning modules. This benefited the students' learning process as they participate in the module's PBL problem and fieldwork activities in the same semester, whereas the prior timetable often had the fieldwork months after the theory was taught. The impact on lecturer time was however problematic, as skills laboratories were presented twice in an academic year and separate class tests were set for each module, effectively doubling the lecturer teaching hours. Major revision and redesign of

the curriculum was thus not a priority, as staff felt that the standards set by the exit level outcomes and the quality of occupational therapy graduates produced by the department were more than satisfactory. A medium-impact integration of BL was thus selected as the intervention strategy[151].

The rollout of BL was monitored during 2009 through informal and formal discourse between the DOT lecturers, students and the researcher. Blended Learning was largely viewed as an adjunctive support strategy rather than a fully integrated approach. Initially it was simply a medium for posting announcements or course notes, and a modality for students to submit assignments electronically. Lecturers felt that they did not have the time to generate new content for the VLE and felt that it was a threat to F2F attendance if the information was also available online. Many of the DOT lecturers were proficient in the delivery of their modules through PBL and found it difficult to step out of their comfort zone, particularly when there was recognition of some lack of computer literacy on their part. It also emerged that WITS intended migrating away from proprietary VLE software to an open source option. This resulted in insecurity among lecturers at having to learn a new system, especially as the University was unclear regarding the timelines and processes of this migration.

Student use of the VLE during 2009 was erratic and varied from class to class, as indicated by the access statistics available from the VLE. Furthermore, their perceived value of the VLE was unknown. There seemed to be a premise that accessing the VLE would take away learning time rather than facilitating/enhancing the learning process. Students felt under pressure for time during PBL sessions, and cited a lack of resources (such as personal computers, available computer laboratory space, cost of internet connection) as reasons for their erratic access to the VLE.

The rollout of BL in the DOT was thus deemed to have fallen short of the true integrated delivery expected of e-learning's role in BL. This resulted in the researcher pursuing a series of studies through Participatory Action Research (PAR).

## 1.6. Research Paradigm

The interpretivist paradigm suggests that a constructivist approach using a qualitative research design would effectively investigate the experiences, perceptions and beliefs of the participants in the study[114,157,158].

### 1.6.1. Paradigm of the research method

Participatory Action Research is founded on the social-constructivist theory[159], while Emancipatory Participatory Action Research (ePAR) involves more of a critical theory approach[159]. To argue for emancipation, the tenets of oppression would be prevalent in the research problem. In this thesis, research focused on changing practice in order to improve the quality of the education process, rather than to break free of a constraining power. Thus, while elements of critical theory emerged during the study, the dominant paradigm remained social-constructivist. In order to create sustainable change within an educational environment it is vital to consider the human factor and the role of change management[160]. The selection of an appropriate research methodology poses a challenge when the collaboration of participants is involved. According to Herr and Anderson[159],

> *"An emancipatory interest orients the researcher toward the release of the human potential and the investigation of ideology and power within the organisation and society. ….. [This] is thought to be subtle and deeply embedded into the belief structure of the organisation and, through the process of critical self-reflection, [existing prejudices and beliefs] can be accessed and surfaced for examination, ultimately leading to transformation" [159 p. 27]*

The research process should support the process of change management, while investigating the impact of the change on the educational context, performance outcomes and perceptions of the participants. The overview of the research design (1.7 p. 35) describes and justifies the use of PAR in creating sustainable change to the educational process of the undergraduate occupational therapy curriculum. Issues around the ethics, validity and reliability of the study are also addressed.

### 1.6.2. Paradigm of the intervention strategy

Lave and Wenger[161] conceptualised Legitimate Peripheral Participation (LPP) as a form of situated learning within a community of practice. They challenged the notion that the master practitioner is the bearer of the knowledge to be imparted to the apprentice/newcomer, proposing rather that knowledge resides in the social structure and legitimacy of membership of the community and participation in the real-world activity of the enterprise.

> *"Indeed, we must not forget that communities of practice are engaged in the generative process of producing their own future." [161 p. 56]*

In this series of studies, the lecturer participants were engaged in situated learning through the development of a BL community of practice. The intervention strategy relied on LPP[161] as

the agent of change in shifting the traditional PBL curriculum towards the practice of BL. The social dynamic and power balance within this community of practice differed from the day-to-day long-established organisational and managerial community of practice of the DOT. Now all lecturers were novice learners within this community of practice and in some cases the novice lecturers were more skilled in using technology than their more experienced peers.

## 1.7. Overview of the research design

### 1.7.1. Research Approach

The study used a transformatory mixed methods research approach[162] to investigate student and lecturer behaviour over four academic years of the curriculum. This approach allowed for both qualitative and quantitative research designs within a study, typically with one design informing the other over time[162]. Quantitative tools were primarily used to investigate student and lecturer behaviours and performance. Qualitative measurement tools were primarily used to investigate student and lecturer beliefs, perceptions and attitudes[163] towards BL. These measurements guided the transformatory processes of the study[162,164] in order to implement change to the e-learning component of the blended learning occupational therapy curricula.

### 1.7.2. Participatory Action Research

The rehabilitative health sciences have recognised the need for research designs that are geared towards empowerment and emancipation of the communities they serve[159,165]. Adopted out of the social sciences, PAR has become a recognised research methodology as it proposes action (in the form of creating sustainable change) while producing evidence of the impact of such action on the community[165].

McTaggart emphasises that PAR “aims to build communities of people committed to enlightening themselves about the relationship between circumstances, action, and consequence in their own situation, and emancipating themselves from the institutional and personal constraints which limit their power to live their own legitimate educational and social values”[166 p. 176]

As one of the few research methods which enables all stakeholders to have a voice and a role in the path the research takes[166,167], PAR was the optimal approach for this study. It is a democratic collaboration[166,168] where all stakeholders become learners through a process of changing behaviours and developing skills to create an organisational change[166,169]. It is a

self-driven re-education and breaking of prior habits and systems[170] to address a common concern[166,167,169]. It is well documented that PAR is a cyclical and systematic process of identifying the problem, planning an intervention, acting (implementing the intervention), observing and measuring the impact, critically reflecting on the process to better understand the outcomes and learn what still needs to be achieved, thus initiating the follow-on cycle of repeating the process[166,169,171]. Mubuuke and Leibowitz[167] propose that PAR is an under-utilised methodology within health sciences education, with the potential to successfully implement education innovations.

Carr and Kemmis[172] and Masters and Ellaway[173] propose that curriculum research may be conducted on a macro-level (from research impacting the education system to a school or departmental research endeavour) or on a micro-level (research between a particular lecturer and class of students). McTaggart[166] referred to this as global and collective versus local and individual. In the research for this these, PAR occurred at both levels. The macro-level considered the undergraduate occupational therapy curriculum as a whole and all stakeholders were involved, and on a micro-level, specific concerns were targeted in collaboration with individual lecturers and with a particular class of students. Figure 1.6 illustrates the PAR cycle, demonstrating how the macro- and micro-levels integrate.

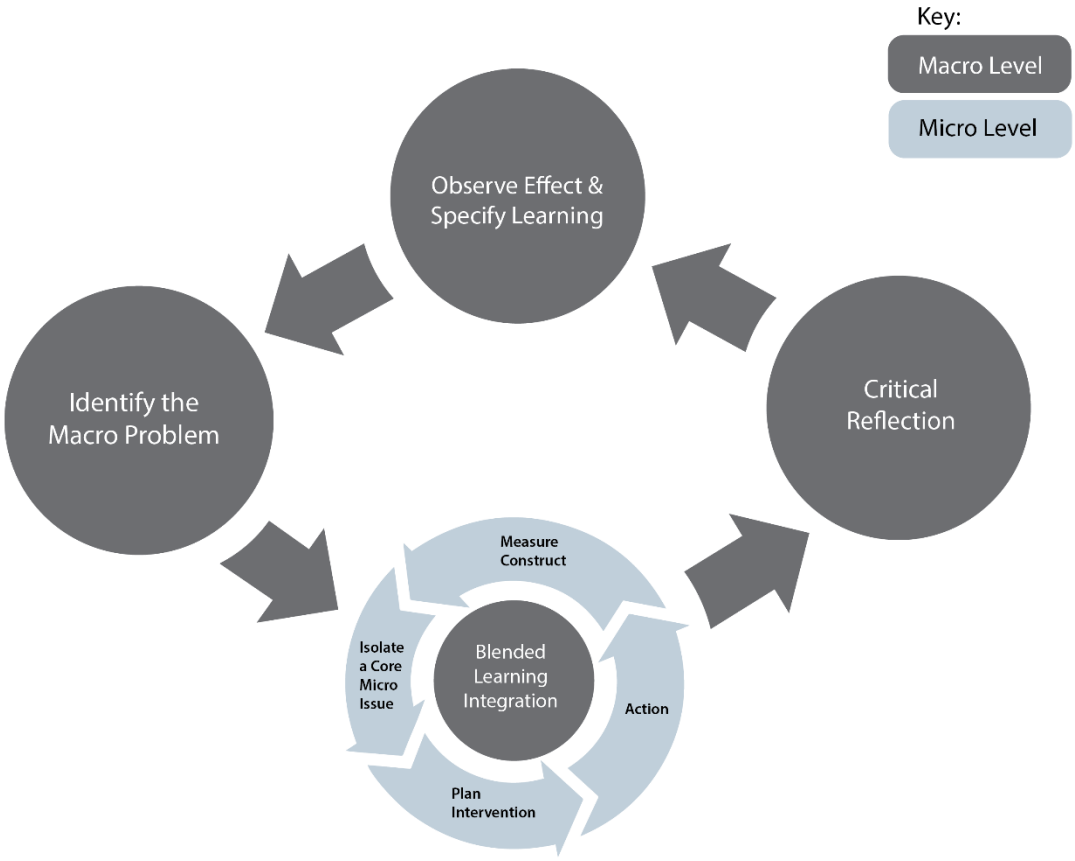



*Figure 1.6 The PAR cycles as applied across the studies in this research*

The research evolved over six years, with an ongoing macro-level spiral and several micro-level cycles (Figure 1.6). During monthly curriculum development meetings, lecturers and the researcher collaborated in reviewing the BL integration process, noting the observed outcomes, and critically reflecting on the status of the research. These meetings were a platform for sharing moments of success, raising issues and concerns, brainstorming ideas for BL activities and determining focus areas of the curriculum for targeted micro-level interventions. Meetings were held with individual lecturers when isolated core micro-issues were identified within specific modules of the curriculum. The researcher and participants embarked on interventions to address these issues, most of which were conducted concurrently or overlapped over one to three academic years per micro-level PAR.

Through LPP[161], a community of practice was established, involving occupational therapy lecturers pursuing a transformed and democratised curriculum for undergraduate students in the DOT. All stakeholders were in a continual state of learning and adapting through critical reflection of the outcomes, feedback from the students, suggestions and innovative ideas from within the community of practice and in consultation with the broader community of the Faculty of Health Sciences (Faculty) and WITS. Presenting interim results regularly at local and international congresses afforded the opportunity to gain input and insights from external communities engaged in similar practices. These engagements stimulated the adaptations and shifts in the intervention strategy and action over the six years of the research. Ultimately, this thesis presents two macro-level studies and three micro-level studies.

## 1.8. Trustworthiness and validity of the research

In PAR, consideration of the trustworthiness and validity of the research is essential to legitimise the outcomes and establish rigour when conducting research as an insider acting within an insider stakeholder group[159]. While many PAR studies fail to mention or establish the trustworthiness and validity of their research[174-176], there is debate as to whether any of the qualitative measures of rigour are applicable in PAR due to the positionality of the researcher[159]. Mann and MacLeod[158] propose five criteria for trustworthiness and authenticity, and Herr and Anderson[159] propose five criteria for establishing the validity of the research.

### 1.8.1. Trustworthiness

According to Mann and MacLeod[158] the five criteria for trustworthiness and authenticity are credibility, transferability, dependability, confirmability and authenticity. These criteria are explored in the context of the research contributing to this thesis.

### 1.8.1.1. Credibility

Credibility is a demonstration that the research has been conducted using accepted methodology, and that the results are generally agreed within the stakeholder group[158]. Credibility is demonstrated through member checking and triangulation[158,177,178]. The stakeholders in PAR formed an LPP community of practice where member checking is inherent in the process[161]. Regular feedback was given to the lecturer stakeholders during staff meetings, curriculum development workshops and during individual collaboration on micro-level PAR cycles. During these sessions there were discussions regarding the research findings, the status of blended learning in the curriculum, and brainstorming new strategies, thereby creating the forum for the PAR cycles.

Triangulation is the use of a variety of data collection strategies to investigate the problem from different perspectives[158,177,178]. The evidence collected during this research reflects the four Brookfield[179] lenses of critically reflective practice: that of the researcher as a learner in the process, the students (the learners' eyes), the lecturers (colleagues) and the literature. Throughout the study the quantitative and qualitative data collection activities were:

- documenting the VLE access and navigation footprint of the students and lecturers;
- surveys of perceptions and experiences of the value of the intervention strategies;
- documenting student academic performance as records of marks and module pass-rates;
- individual interviews with the lecturers;
- focus groups with lecturers and students;
- audio recording and note-taking during staff meetings and curriculum development meetings;
- capturing artefacts of learning and communication between stakeholders such as emails from lecturers and students, screen shots of the VLE, and photographs of blended learning activities;
- capturing of external artefacts that impacted the study such as the Health Professions Council of South Africa (HPCSA) curriculum audit report 2014, and the nomination and award of the Vice Chancellors Team Teaching Award for 2010;
- the researcher kept an electronic journal of events, thoughts, decisions and inspirational moments that shaped the course of the study.

### 1.8.1.2. Transferability

Transferability is the degree to which the findings of a study can inform practice in other comparable contexts[158,177]. The context of the research should be reported in detail and the interventions and outcomes sufficiently described to allow external communities the ability to

determine the goodness of fit to their own context, and thus the possibility of implementing similar interventions with reasonable expectation of similar outcomes[171]. While the South African higher education landscape grappled with massification, and the realities of 'digital apartheid' impacted the student access to the VLE and their online resources, the DOT embarked on the challenge of integrating BL into the undergraduate occupational therapy curriculum. Local context posed some unique challenges that may not be relevant in first-world occupational therapy curricula, but the DOT has overcome such challenges (e.g. the University's lack of a successfully integrated and stable VLE), has taken advantage of innovative technology (the rise of TCD's over the Personal Digital Assistant) and has created a community of practice that is self-driven. This story has motivated other departments within the Faculty to engage with BL despite not using PBL for curriculum delivery. For example: while the physiotherapy curriculum at WITS is delivered through traditional lecture-based teaching as opposed to PBL within the occupational therapy curriculum, the student body is of similar socio-cultural background, studying within the same building, and share some of the foundation sciences subjects. The Department of Physiotherapy has adopted the use of the same VLE and implemented some of the BL strategies that have been successful in occupational therapy, demonstrating that transferability of practice-based evidence is possible. Transferability within the Faculty is an indicator that similar contexts within WITS and other South African higher education institutions may benefit from what has been learnt, as disseminated through congress presentation and the publications within this thesis.

#### *1.8.1.3. Dependability*

Dependability is the quality of the documentation of the research process such that it may be audited and replicated[158]. The study protocol was presented to the Faculty research committee and ethics committee for approval prior to embarking on the PAR. The PAR cycles were regularly presented at congresses and curriculum workshops for external scrutiny of the methodological procedures. Many of the implementation strategies, data collection tools and data analyses and interpretation of results were collaboratively established through debate, brainstorming and comparing evidence and outcomes by the stakeholders involved. Thematic content analysis of the qualitative data was reviewed by a colleague with similar knowledge and experience but not involved in the study. Randomly selected transcript extracts were independently coded to ensure consistency of interpretation. The COnsolidated criteria for REporting Qualitative research (COREQ) checklist for paper 5 was submitted to BMC Medical Education. Transparency of the research process was established through the LPP community of practice[161], thus demonstrating the dependability of the study.

#### 1.8.1.4. Confirmability

Confirmability is the declaration of positionality of the researcher within the study and the acknowledgement of the influence of personal beliefs and perspectives on the study outcomes[158,178]. As the researcher, I have declared my worldview as presented in this thesis (1.9 p. 43) and researcher bias was interrogated. Positionality is the researcher's acknowledgement of the degree to which stakeholders are an insider or outsider of the research context and stakeholder relationships[159]. There is clear acknowledgement that the researcher here is an insider in this LPP community of practice, and thus had influence over the research process through acting as an insider researcher collaborating with insider stakeholders.

#### 1.8.1.5. Authenticity

To demonstrate authenticity, the researcher must show ongoing and consistent commitment to the values presented to the stakeholders and that the researcher actions can be trusted, without hidden motives[158,180]. An important level of trust was placed in the researcher, particularly by the lecturer stakeholders, as noted in the quote in paper 5

> *Lecturer A, anecdotal commentary (2010): "We trust you – you know far more about this stuff than we do".*

The stakeholders maintained their participation in the drive to integrate BL into the undergraduate OT curriculum for over six years, as the belief in the process and observed outcomes never wavered.

### 1.8.2. Validity

According to Herr and Anderson[159] validity in PAR is established through meeting five criteria which are closely linked to the intrinsic goals of PAR: dialogic validity, outcome validity, catalytic validity, democratic validity and process validity.

#### 1.8.2.1. Dialogic validity

Dialogic validity is a demonstration that the study generated new knowledge[166,171] as evidenced through peer review and critical, reflective dialogue within the practitioner community[159]. Throughout the research process the studies that formed micro-level cycles of the PAR were presented at local and international congresses and submitted for publication in nationally and/or internationally accredited journals, providing the opportunity for peer-review and critical debate within the health sciences education community. The macro-level study (paper 5, p. 81) was published in an international journal with a five-year impact factor of 1.929[181]. Paper 2 (p. 57), paper 3 (p. 67) and paper 4 (p. 74) are micro-level studies,

accepted for publication or published in the South African Journal of Occupational Therapy. Paper 3 currently has five citations. By exposing the research to peer scrutiny, meaningful contribution to the body of knowledge is evident.

#### *1.8.2.2. Outcome validity*

The outcome validity considers whether the presenting problems are addressed and resolved by the actions implemented through the research process to achieve the research objectives[159]. The pragmatic and naturalistic research processes were blended into the PAR cycles, providing evidence that the outcomes of each PAR highlighted evidence of successful actions and new areas of concern. The outcome of each objective of this study is addressed in the papers presented in this thesis and evidenced by full penetration of BL into all levels and modules within the occupational therapy undergraduate curriculum.

#### *1.8.2.3. Catalytic validity*

Catalytic validity reflects the growth in understanding and perception of reality of all stakeholders of the action research study, the ongoing buy-in, and the transformative nature of the process[159,180,182]. It is development reflexivity[171], and demonstrates the personal transformation of the stakeholders[183]. During the study the researcher kept a journal of 'wow moments' which included a record of events and thoughts that influenced the path of the study and reflected on the transformation and change agents within the research process. During interviews and focus group sessions with the lecturers there was an overwhelming theme of 'no going back' and a sense that 'this is how we do it now'. Uptake of BL is strongly evidenced through all the papers presented in this thesis. The students quickly became part of the drive that built impetus towards BL with statements like 'just put it on e-OT ma'am'. The way we all think about teaching and learning has transformed towards 21CLD.

#### *1.8.2.4. Democratic validity*

Democratic validity (or ecological validity) is the degree to which all stakeholders have influence over the study path, being able to raise problems and contribute to the brainstorming of new intervention strategies[159]. It is more than simply being heard, it is collaborating[171] and unifying existing knowledge and skills within[166], while having power in the social transformation of the community of practice[159,161]. All stakeholders were involved in all cycles of the PAR process, both formally and informally. The e-learning project team was housed in the DOT, making accessibility and an open-door policy an asset, where students and lecturers were encouraged to raise issues and bring ideas on BL opportunities. During curriculum meetings there were concerted efforts to dispense with the managerial hierarchies and focus on collaboration. All stakeholders had equal voice throughout the research.

#### *1.8.2.5. Process validity*

Process validity considers how closely the cycles of identifying the problem, developing and actioning an intervention strategy, measuring the outcome and critical reflection truly informing the ensuing cycles of PAR[159]. This can be evidenced through triangulation as well as a sense of 'does it ring true?'[159]. Process validity is established through the degree to which the researcher is embedded in the community of practice[182], is involved in every stakeholder's story[182] and the community of practice is committed to the action and critical reflection in order to inform practice[171]. Embarking on the strategy of integrating BL into the undergraduate occupational therapy curriculum was a collaborative, needs-driven decision, with the support and buy-in of Faculty management. The researcher was part of this decision in 2008 while still an entry level lecturer within the DOT, and on transferring into the e-Learning role in 2009 was viewed as the 'best person for the job'. Having a sound knowledge of the structure and learning objectives of the undergraduate occupational therapy curriculum was an advantage, as the researcher was considered part of the team and not seen as an outsider imposing views on the DOT. Regular curriculum meetings were held as a way to maintain commitment to the integration process and create opportunities to reflect on action. At the time of writing, all stakeholders continue their participation as active learners in this community of practice.

### 1.8.3. Researcher bias

The process of PAR embeds the researcher in the community of practice, creating an intimate ownership and investment in the research outcome, which can obviously result in researcher bias when interpreting data[159]. Reflective practice is a way for a researcher to engage with own biases and determine the influence they have on the research process and outcome[177]. I, as the researcher, acknowledged my positionality as an insider researcher collaborating with colleagues within a community of practice from the outset of the study, and subsequently used three mechanisms to reflect on personal biases throughout the study:

**Critical friends**[159]: Two people took on the role of critical friends. The first is a colleague who was part of the lecturer community of practice involved in the study. She was also in the process of conducting her PhD research and has experience with PAR and qualitative methodologies. Being embedded in the study herself, she had the 'insider lens' from which to challenge my thinking. The second is my partner, who was until recently the managing director of a media company and has interest in entrepreneurship and organisational change. His 'outsider lens' and generally critical world view provided a neutral sounding board and he regularly played 'devil's advocate', forcing me to explain and justify my premises.

**Engaging with the broader e-learning community**: I committed to taking opportunities to be involved in the activities of the e-learning community within WITS as well as nationally. I participated in the working party on developing the e-learning strategy for WITS, was involved in the annual WITS teaching and learning workshops, and attended conferences and discussion forums related to e-learning and blended learning particularly, within higher education. These activities were an opportunity to ensure that I maintained alignment with the WITS strategic plan and policy, and engage with people working in the field to discuss my outlook at each point.

**Keeping electronic notes**: I used OneNote from the early stages of the study to reflect on events in a journal style. I emailed and captured thoughts, tweets and images in Evernote. At meetings and conferences, I used Audionote to record both the content and my thoughts at the time. Reviewing these notes provided direction and created a sense of grounded confidence that I was on the correct path.

## 1.9. Worldview of the Researcher

In declaring my worldview, I establish the philosophical context for the study and how this worldview was shaped both prior to and during the study[157]. While the scientist in me would easily align with a positivist paradigm (what we can measure and observe is considered our truth[158]), interpretivism resonates with the profession of occupational therapy, my role as an academic, and my positionality as an insider researcher in this study. Interpretivism holds that our reality is subjective and dynamic, knowledge is constructed through experience and is complex and under social influence[157]. As a researcher, interpretivism holds importance in the real-world experiences, contextualised within a specific phenomenon, with no expectation of generalisation of the findings[114].

From an ontological perspective[157], the theory of occupational therapy holds a relativist view, where multiple realities exist and are unique to an individual's experiences and environment[158]. Occupational therapy theory instils a belief that each person is an occupational being, whose occupational performance is determined by personal characteristics, occupational context and socio-cultural environment[94]. Several occupational therapy practice models engage with the interplay between these components[184], but Dunn et al[118] designed the Ecology of Human Performance framework, employing the analogy of a lens. The context (physical, social, temporal and cultural) within which a person performs, forms a lens through which to view the person and how s/he engages in occupational tasks to fulfil her/his roles, ultimately giving the occupational therapist a view of that person's reality. This shares John Dewey's beliefs in considering an ecological perspective as

described in 1.4.1.2, p. 24. Dunn et al[118] acknowledge that while experiences and perceptions may be shared and that commonalities exist, each person's experience is a unique product of her/his participation within her/his context[118,184]. This framework has shaped my view of the world through the relativist lens[158], as I believe that each person's reality is unique and shaped by who they are, whom they know and what they experience.

My high school education and undergraduate training in occupational therapy during the last years of Apartheid in South Africa was hinged on behaviourist learning. We learnt what we were told, did not question the validity of the knowledge provided, and autonomy was disregarded in favour of conforming to an industrialist educational context[115]. In 2001, I entered academia after practicing as a paediatric occupational therapist in a primary education setting for seven years. This was my first move away from a behaviourist epistemology, as the occupational therapy curriculum had migrated from a lecture-based didactic model to PBL. I learnt to question what I thought I knew through teaching on the postgraduate Masters degree course, doing a Masters degree by dissertation, and being exposed to the cognitive-constructivist PBL instruction technique[185]. In exploring Siemens'[98] concept of connectivism as a social-constructivist learning theory, the constructivist epistemology became imbedded in my approach to teaching[157,158].

McMillan[157] and Tuli[114] emphasise the importance of establishing the researcher's worldview, as the epistemological and ontological assumptions influence the research paradigm, method and trustworthiness.

### 1.9.1. The researcher's journey

I entered this research as a relative novice in understanding the education theories and the instructional design aspects of BL. During the research I endeavoured to up-skill myself in order to enhance the opportunities to contribute insights regarding pedagogy and BL to our community of practice. I have never claimed to be an expert in BL, but recognised that my relative knowledge was ahead of my peers, positioning me well to drive the process of integrating BL into the undergraduate occupational therapy curriculum. I felt particularly disadvantaged in my knowledge of pedagogy and learning theory at the start of the study, despite having been a lecturer in the DOT for nine years.

The Sub-Saharan African FAIMER Regional Institute (SAFRI) fellowship program afforded the opportunity to learn more about health science education, and developed a network of health science educators with whom to engage in debate about educational tools, techniques and theories within the African context. I took every opportunity to attend local and international congresses in order to develop my own personal learning network. I became

involved in the Faculty ICT committee and attended WITS teaching and learning symposia in order to build my profile in BL.

During 2010, I was selected as a member of the WITS working group to partner with an external technology company to investigate the open source VLEs that would be most suitable as the WITS VLE in light of the instability of the 'home-grown' VLE that was being used at the time. Through this my personal learning network expanded to include software developers who were experienced with VLE programming. The evaluation report recommended that WITS integrate Sakai as the institution VLE in 2011 despite some schools at WITS already using Moodle[186]. The decision was largely based on Sakai appearing to be slightly more economically viable and at the time there were more top one hundred universities using Sakai. All other features between Moodle and Sakai were similar, and both Sakai and Moodle outperformed the 'home grown' VLE that was implemented at the time[186]. The DOT continued to use Moodle with the agreement that content would be migrated to the WITS VLE at the time the performance of both platforms was equal or the WITS VLE offered more.

Receiving the Vice Chancellors Team Teaching award at the end of 2010 for the impact of BL within the occupational therapy curriculum engendered confidence through the notion that at an institutional level I had been on the right track.

## 1.10. Aim of the research

The PAR aimed to facilitate the integration of BL into the undergraduate occupational therapy PBL curriculum and investigate the lecturer and student attitudes towards and perceptions of BL and the impact of this process on teaching and learning within the DOT.

### 1.10.1. Objectives of the research

A. Establish a stable VLE that would not be impacted by the University migration process and train the lecturers on the tools and pedagogy associated with BL.
B. Orientate students to the VLE and other online resources with the view to improving their digital literacy and engagement with BL opportunities.
C. Identify micro-level issues during the integration of BL, collaborate with individual lecturers to develop and implement an intervention, and measure the outcomes associated with the intervention.

D. Critically reflect on the macro-level integration of BL on the undergraduate occupational therapy curriculum from the perspectives of each stakeholder group in order to observe the effect and specify the learning and development that took place.
E. Offer a guideline for other departments engaging with integrating BL into their undergraduate therapeutic sciences curricula, particularly within the context of PBL.

## 1.11. Conclusion

Chapter one presented a review of the literature contextualising the research presented in this thesis. The South African higher education landscape was described from the transition away from Apartheid to a snapshot of the current state of higher education in South Africa. The influence of globalisation, massification and managerialism on the transformation processes was considered. The three dimensions of 'digital apartheid' were explored and the impact of 'digital apartheid' on student participation in learn activities presented. Finally, the education theory supporting the direction of the research presented in this thesis was discussed and the rationale for the relevance of connectivism and 21CLD to the research context was provided.

The context of the research was presented by identifying the macro-level problem facing the DOT, and describing the research in terms of paradigm, research design, trustworthiness and validity. The world view of the researcher was declared, highlighting the positionality of the researcher as an insider in the PAR and the journey of the researcher through the research process. Lastly the aims and objectives of the PAR were stated.

Chapters Two to Six present five studies in the form of research papers submitted to congress proceedings or accredited journals. There are two macro-level studies (paper 1 and 5) and three micro-level studies (papers 2 to 4). Chapter seven reflects on the research objectives of this thesis and how the papers have addressed these. Finally, the way forward is suggested.

# Chapter 2. Paper 1

## 2.1. Introduction to paper 1

This paper was presented as a poster (Appendix C) at the EDULEAR10 - International Conference on Education and New Learning Technologies, 5th - 7th July 2010 Barcelona, SPAIN, along with two additional poster presentations (Appendix D) and an oral presentation (Appendix E).

Paper 1 represents the first six months of the research, showcasing the macro-level PAR (Figure 1.6 p. 36) with a focus on the lecturer stakeholders' experiences of BL. The contribution of this paper to the research is in illustrating the degree of early uptake and buy-in to using a BL approach within the PBL curriculum. The participation strategy and the action taken are described from the perspective of the lecturer participants. The observed effect was measured through a mixed-methods study combining the data from staff meeting notes, the VLE access footprint of lecturers and a survey.

From the results we learnt that the lectures were all committed to the action taken, as they felt that the students had a generally positive attitude towards BL, that it improved communication with students and it supported teaching and learning activities. Lecturers mainly used the VLE to post notes and use the news forum, indicating scope to develop how they could further integrate the other tools such as online lessons, wikis, and formative assessment. Concerns were raised regarding the efficiency of the server hosting the VLE as there were some signs of server instability. The other dominant concern was the lack of integration of plagiarism scanning software in the VLE, despite WITS having an institutional licence.

The lecturer participants felt a sense of ownership of BL and recognised the early success and up-take by both the student participants and lecturer participants.

## 2.2. Paper 1: Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy.

Barnard-Ashton PM. Lecturer feedback of the inclusion of blended learning in undergraduate occupational therapy. *EDULEARN10 Proceedings*. 2010:492-499
https://library.iated.org/authors/Paula_Barnard-Ashton

Status: Published – Copyright permission by EDULEARN was received 04 February 2017 (Appendix F)

# E-LECTURER FEEDBACK OF THE INCLUSION OF BLENDED LEARNING IN UNDERGRADUATE OCCUPATIONAL THERAPY

**Paula Barnard-Ashton**

*University of the Witwatersrand (SOUTH AFRICA)*
*paula.barnard@wits.ac.za*

## Abstract

The Department of Occupational Therapy (DOT) is developing a blended learning curriculum with the guidance and support service of the School of Therapeutic Science e-Learning Project. This Participatory Action Research (PAR) study facilitates documents and researches the efficacy of the inclusion of e-Learning tools into the third and fourth year occupational therapy curricula. The PAR is a cyclical process which is regularly repeated during the academic year. At the start of each cycle the baseline status of e-Learning in the curriculum will be evaluated. The lecturers of the DOT will participate in brainstorming workshops to develop the e-Learning intervention tools and content. Efficacy measures will be designed during the workshops. The e-Learning intervention will be implemented, the measurement data gathered and then analysed using mixed methods. The results of each cycle will form the baseline analysis and interpretation information for reflection status for the following cycle. The study will be conducted over two full academic years starting in January 2010.

This paper presents the results of a survey, focus group and record review of the primary qualities of the e-Lecturer after the first term of blended learning. The qualities measured through the study are: Beliefs, Attitude, and Performance. The population is the 12 lecturers of the DOT, a graphic designer and the researcher, who all participate actively in the study. The results of the study are both reflective and formative. There is a strong belief in the value of blended learning, but also frustrations related to e-Lecturers' computer skills and technical support for back-end technology. All e-Lecturers have actively engaged in blended learning during this term and report that the e-Learners are motivated to engage in these activities. This paper reviews the tools most frequently applied and their perceived value.

Keywords: Blended learning, occupational therapy, participatory action research.

## 1. INTRODUCTION AND BACKGROUND

Blended learning is the combined and integrated use of e-Learning and face-to-face (F2F) learning activities to develop a community of learning [1-3]. This teaching approach is a relatively new development within the occupational therapy curriculum at the University of the Witwatersrand. Traditionally this curriculum has been a purely F2F, problem-based learning (PBL) design, which is a common method of curriculum delivery in the field [4-8]. This curriculum has a particularly high demand on lecturer resources due to the group work and practical, clinical nature of the curriculum. During the third and fourth years of the curriculum, students are placed in hospitals and other clinical environments for their fieldwork experience and are thus not on campus for much of their learning context. The incorporation of blended learning was adopted as a means of enhancing the learning opportunities, optimising communication within the occupational therapy courses and alleviating some of the lecturer time resources [8-10].

In late 2008 the School of Therapeutic Science e-Learning Project was established to support eLearning initiatives within the school. The first focus of the project was supporting the DOT in the development of blended learning, including the development of virtual learning environments (VLEs), staff and student training, investigation and implementation of blended learning strategies and researching the effectiveness of the project. Initial VLEs were developed in Blackboard [11] as this was the software licence carried by the university. During the academic year of 2009 the VLEs were primarily used for posting lecture notes and materials for student access. The university publicised a decision that the licence for Blackboard would not be renewed and that an internally developed system would be launched during 2010, developed from free and open source software. This stimulated the

interim migration of the VLEs to a Moodle platform [12] on a local university server to ensure that the 2010 academic year was not interrupted by system changes.

The undergraduate occupational therapy PBL curriculum requires that all lecturers are involved in curriculum delivery for each of the coursework years. Lecturers are responsible for co-ordinating and planning PBL problem scenarios related to their field of expertise, but are also involved in facilitating problem groups and supervising fieldwork across the curriculum. The VLE for a course is developed and contributed to by all staff, and is thus a collaboration of content and tool application. E-Lecturers do not have a specific VLE for each component of the course, there is rather one VLE per course year (i.e. third year occupational therapy, code:OCCT3000) .

This paper uses the terms e-Lecturer and e-Learner [8] to represent the roles of the participants within the blended learning approach. This paper focuses on the beliefs, attitudes and behaviours of the eLecturer after the first term of 2010. The study aimed to:

- Document e-Lecturer behaviour in order to determine the level of uptake of blended learning by e-Lecturers.
- Determine e-Lecturer belief in the value of blended learning.
- Determine e-Lecturer attitude towards blended learning.
- Determine e-Lecture VLE tool preferences.

The results of the study would guide the initiatives and development of enhancements to the blended learning delivery within the third and fourth year occupational therapy curriculum for the second term of 2010.

## 2. METHOD

This paper presents the first cycle of a PAR study (term 1 of 2010). PAR involves a cyclical process of investigating the problem (refer 2.1); collaborating with stakeholders (refer 2.2) to reflect on the problem and pose a possible change strategy; implementing the strategy/action (refer 2.3), and then investigating (refer 2.4) the impact of the action which in turn presents emergent problems for the next cycle [13-15]. PAR is particularly applicable in this form of study as it presumes collaboration between the researcher and the participants with a view to the professional development of all parties [14]. Though smaller PAR cycles have occurred within this cycle, the overall impressions of the first term from the e-Lecturer perspective are covered here.

The PAR study implemented a mixed methods design with the quantitative data analysed descriptively [15] and qualitative data analysed for themes using a single level horizontal thematic analysis [16]. There were 12 e-Lecturer participants of the 13 DOT lecturer staff.

### 2.1 The Problem

The problem was identified during a DOT staff meeting which reflected on and explored the use and benefits of blended learning during 2009. It was noted that the VLEs would be temporarily enabled via a Moodle platform from the onset of the 2010 academic calendar. This transition raised concern regarding the skill level of some e-lecturers to cope in a new VLE application, and the unfamiliarity of the new platform generated a level of anxiety. The consensus was that the VLEs were primarily used in 2009 for posting lecture notes or communicating notices to the e-Learners.

E-Lecturers expressed the need to reduce their use of time resources, increase their academic output of research and efficiently manage their undergraduate curricular responsibilities. There was a desire to explore the use of the VLEs for other student learning activities and monitoring of student progress. A dominant concern identified by e-Lecturers was the F2F time-spend on individual student tutoring that occurred on an ad hoc basis as students approached e-lecturers with questions.

### 2.2 Participation Strategy

The strategy consisted of the following components:

- A decision was taken that VLE platform (Moodle) would remain consistent during the 2010 academic year so that e-Lecturer and e-Learners would not be exposed to a mid-year change.

- The VLEs would be branded with the label “e-OT”, and each curriculum year’s VLE would be designed to have the characteristic colour of the curriculum year and present an environmental “feel” of being in that year’s VLE. The branding was considered an important aspect so that e-Lecturers had a uniform term for referring to the VLE and it would create a sense of belonging to that particular course. E-Lecturers are involved in all undergraduate curriculum years, so when moving from one VLE to another, they could easily be distinguished by the colour and design.
- E-Lecturers were invited to attend a morning live Moodle training session facilitated by the School of Therapeutic Science e-Learning Project.
- E-Lecturers indicated that they would encourage e-Learners to use the discussion boards to post queries (instead of F2F meetings) so that many students could benefit from the discussions and contribute to peer learning.
- E-Lecturers were encouraged to use the quiz tool to generate self-tests or formative assessments, which could provide e-Learners with instant feedback and grading of their abilities.
- E-Learners would attend a scheduled computer based training session which introduced them to the tools and functions of the VLE for their course.

The participants agreed that measurement of the participation and efficiency of the blended learning implementation (refer 2.4).

## 2.3 Action

School of Therapeutic Science e-Learning Project designed colour specific, ‘e-OT’ branded VLEs (fig. 1) for each curriculum year in the Moodle platform, which was hosted on a local server. Each curriculum year has an assigned colour (e.g. third year is pink) which is used for easy identification, thus all notes are printed on the colour paper for the specific year and the VLE for that year has the same overall colour.




Figure 1 Screen shot of the 3rd year e-OT VLE

E-Lecturer and e-Learner training was provided in the first month of 2010. This session covered introductory training and exploration of all the tools available within the VLE. During the training session there was brainstorming of ideas as to how the tools could be applied to address the problem identified in 2.1. An example was the use of discussion boards for e-Learners to raise questions that could then be answered by other e-Learners or e-Lecturers. These online discussions would also serve to support the learning of other e-Learners through this more collaborative approach. The

eLecturers were encouraged to contact the School of Therapeutic Science e-Learning Project for any assistance needed.

The curriculum delivery method was primarily F2F and PBL in nature, but all e-Lecturers were more aware of using the blended learning strategies during their teaching and learning activities. Some of the VLE activities that were novel to this particular curriculum were:

- The use of wiki's during a group based workshop to collaborate and share group notes on the development of childhood occupations during the sensory-perceptual problem.
- An online Science of Occupation class test on the psychosocial problem, using multiple choice questions, true-false questions and matching questions. This was conducted in a computer laboratory on campus and was password protected. E-learners had access to their test results as soon as the test was closed.
- Use of chat rooms as virtual PBL rooms with a facilitator and the group participants discussing the problem synchronously.

## 2.4 Investigation

The e-Lecturers and the School of Therapeutic Science e-Learning Project team used the following data collection methods.

- Reflection and comment on blended learning at the monthly staff meetings.
- Online survey, using surveymonkey.com, of the e-Lecturers beliefs and attitude at the end of the first term. The survey requested a scaled rating (positive to negative) of statements related to their beliefs regarding e-OT, ranking of their use of the VLE tools and comment of what they like most, least and find most frustrating in the use of blended learning.
- E-Lecturer VLE access statistics logged at the end of the first term for the third and fourth year occupational therapy courses.

The data were collected in the second week of May 2010 and analysed using descriptive statistics and thematic analysis.

## 3. RESULTS AND DISCUSSION

The participants in the study consisted of 12 of the 13 e-Lecturers in the DOT, one e-Learning manager and a graphic designer. There were nine full-time and three part-time e-Lecturer participants, and their expertise ranged well across the scope of occupational therapy practice as they form 92% of the DOT academic staff.

## 3.1 Staff Meeting Discussions

The e-Learning manager regularly attended the DOT staff meetings in order to document and participate in blended learning progress discussions. The e-Learning manager took notes of the meeting discussions, and meeting minutes provide an official record of the discussions. Not all staff members attend all meetings, based on conflicting commitments, but there is an above 80% average attendance. Table 1 indicates the themes noted during these meetings.

Table 1 Themes that emerged during DOT staff meetings

| THEME | COMMENT |
|---|---|
| e-Learner positive attitude | • It was reported that students were enthusiastic about e-OT.<br>• Student-staff meetings: e-Learners noticed the increased use of the VLEs and appreciated the availability of resources. |
| Server and network inefficiency | • Chat rooms do not work when the whole class is online.<br>• Class test quiz did not work with the whole class online, class had to be rotated through the test (10-12 e-Learners at a time).<br>• e-Learners and e-Lecturers are unable to access e-OT at times. |

| | |
|---|---|
| Plagiarism monitoring software | • The lack of plagiarism monitoring software is of concern. It was available through the Blackboard platform. There is concern about peer copying of clinical reports and assignments. |
| Success | • e-Lecturers feel that are generally able to use the tools on the VLE.<br>• Noted that almost all students were regularly accessing eOT. |

These four themes (table 1) dominated the discussions under the appropriate agenda item at the three staff meetings.

### 3.2 E-Lecturer Survey and Access Logs

An email containing the link to an online survey via surveymonkey.com was mailed to all e-Lecturers of the DOT. The survey took approximately five minutes to complete. All 12 e-Lecturers responded to the survey within the allotted one week. On the day the survey closed the e-Lecturer sequential access logs for the third and fourth year VLEs for term 1 were downloaded in Excel format.

The survey polled the e-Lecturer beliefs regarding the implementation of blended learning during the first term of 2010 (fig.2).

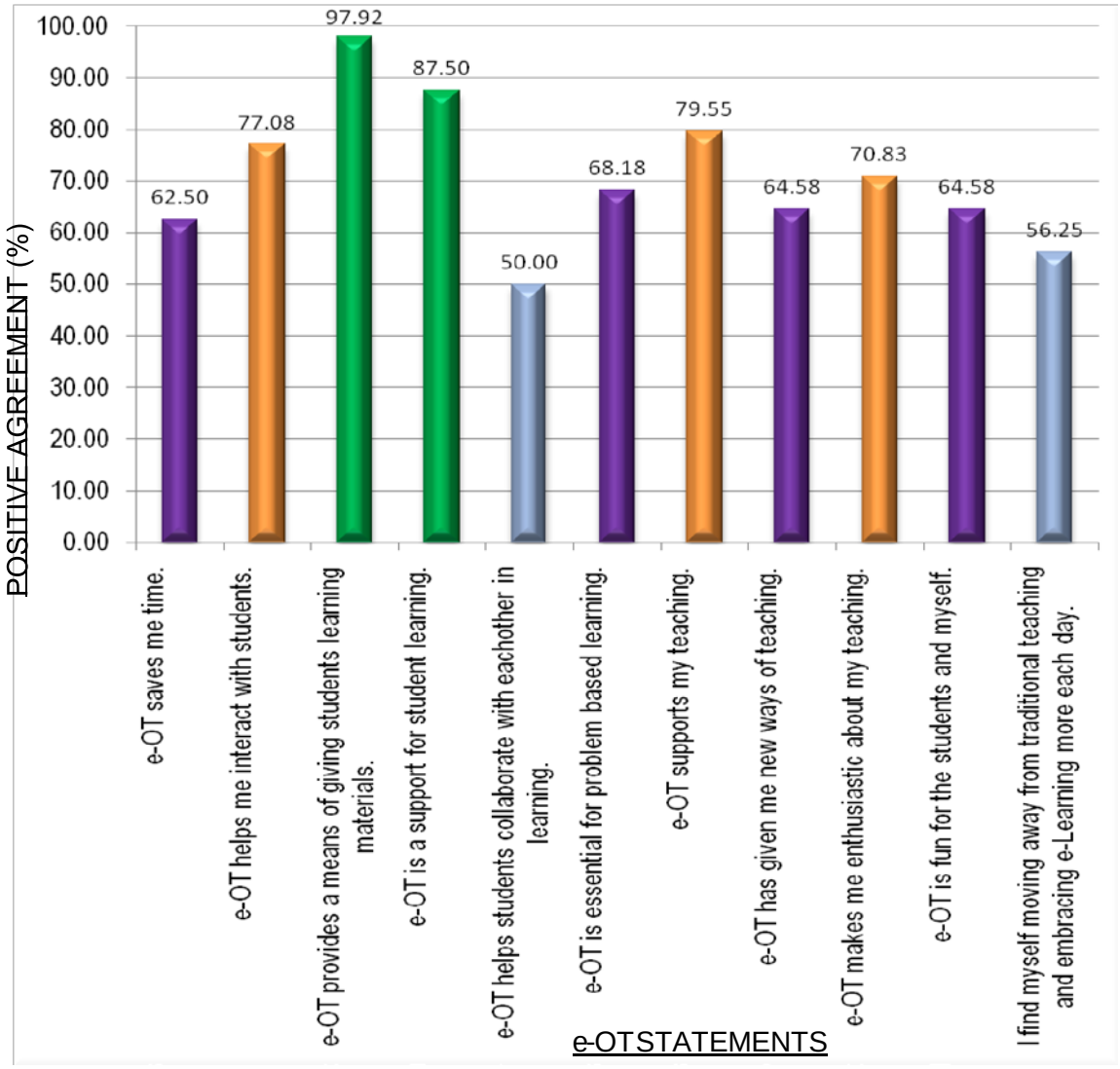



Figure 2 e-Lecturer attitudes and beliefs towards e-OT

E-Lecturers were asked to rate statements on a 5-point scale (definitely; yes; occasionally; I don't think so; definitely not). The data were analysed descriptively in terms of percentage, where 100% indicated consensus of response of 'definitely' to the statement and 0% indicated consensus of response of 'definitely not'. Thus the higher the percentage indicated in fig. 2, the more positive the eLecturers are towards the statement.

The results indicated that the e-Lecturers believe strongly that "e-OT provides a means of giving students learning materials" (97.92%) and that "e-OT is a support for student learning" (87.50%). The e-Lecturers are least convinced that "e-OT helps students collaborate with eachother in learning" (50.00%) and that they find themselves "moving away from traditional teaching and embracing eLearning more each day (56.25%). These are however still positive results as results below 50% would indicate beliefs tending towards 'I don't think so' and 'definitely not', results near 50% indicate consensual response of 'occasionally'.

The survey asked the e-Lecturers to rank the VLE tools in a sequence from most used to least used (fig. 3). While the access statistics could provide more accurate identification of VLE tool use it is important to determine the e-Lecturers more personal perception of frequency of tool use as it indicates their preference and perceived experience.

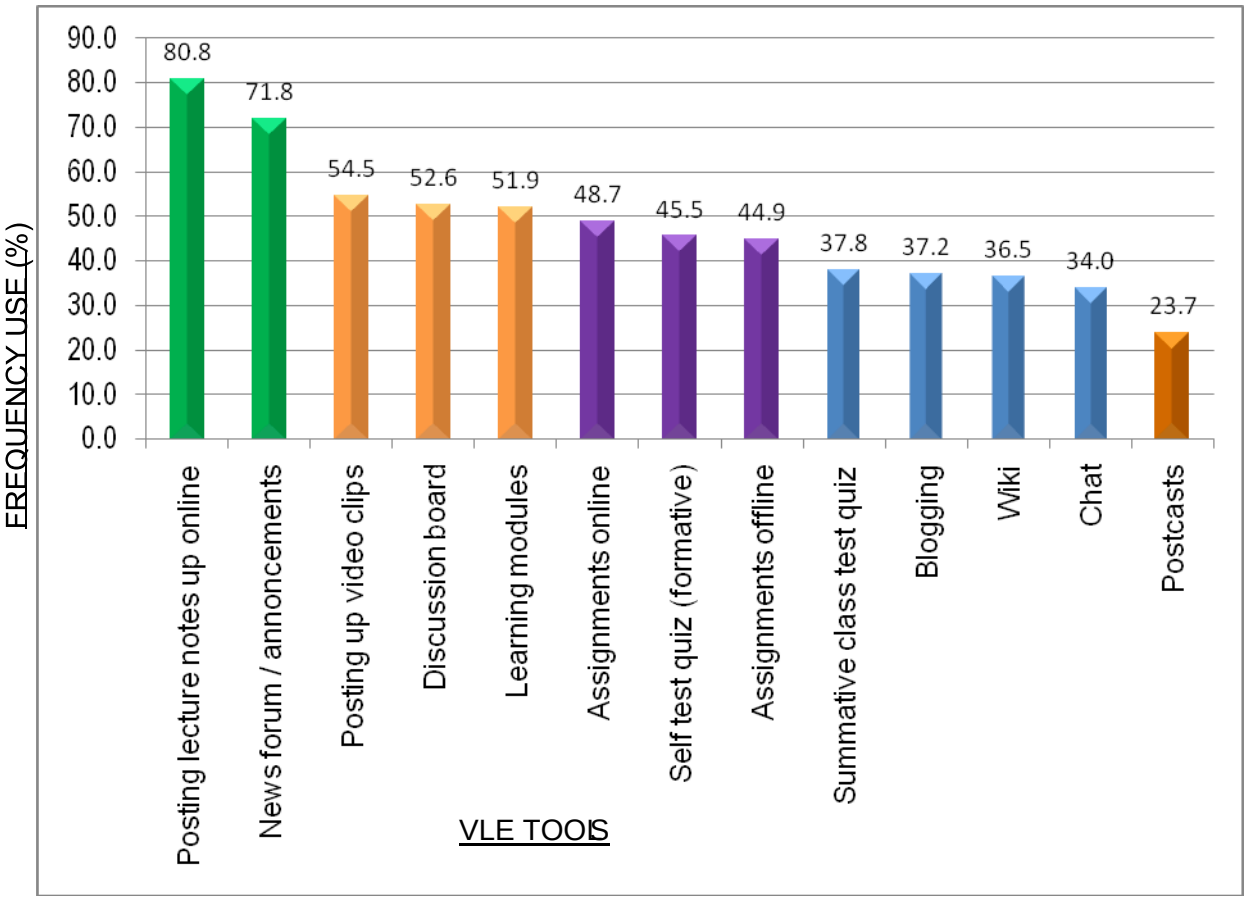



Figure 3 e-Lecturers ranking of use of VLE tools during the first term 2010

E-Lecturers preferred to use the VLE to post lecture notes (80.8%) and use the news forum/ announcements (71.8%). The least used tool is podcasting (23.7%) and 25% of the respondents indicated that they did not know what a podcast was. These results were supported by the e-Lecturer access logs.

While "posting of video clips" (54.4%) appeared popular, the access logs do not indicate any video clips posted on the VLEs. The access logs indicate that 16.7% of the e-Lecturers implemented wiki's within their teaching activities, and this was also indicated to be unpopular in the ranking (36.5%).

Although summative assessment and chat activities were attempted during the first term, these synchronous activities were ranked as unpopular. Synchronous activities place a high demand on the server and network which hosts the platform and content. Problems were identified in the processing speed of the server, the memory of the server, the network proxy settings and the bandwidth overload during such activity, which may have influenced the e-Lecturer confidence in applying these tools.

Review of the access logs indicated that 83.3% of e-Lecturers actively contributed the content on the VLEs of the third year course and 66.7% to the fourth year courses. Both VLEs have been accessed by 100% of the e-Lecturers during the first term of 2010. This indicates that all e-Lecturers are using blended learning to support their teaching and learning activities in the occupational therapy undergraduate third and fourth year curriculum. The year co-ordinators and PBL problem coordinators were noted to access the e-OT site most regularly (at least once a week). Of the two (16.7%) e-Lecturers who had not contributed to the content of the VLEs, one reported that she is a part time lecturer and had not received training on the VLE tools.

Open ended questions were used to determine the e-Lecturers opinions of what they liked the most, the least and found most frustrating. The emergent themes were similar to those raised during the staff meetings, with many citing the server and network inefficiency, the process to upload documents, lack of plagiarism software and feeling generally computer phobic. On the positive aspect, 41,7% cited that blended learning gave them better communication with the e-Learners, many felt that blended learning holds many more opportunities to explore and that overall it was of value.

## 4. CONCLUSION

The DOT e-Lecturers (12 of 13) participated in a PAR study to collaborate with the School of Therapeutic Science e-Learning Project to implement blended learning into the third and fourth year undergraduate occupational therapy curriculum. Data were collected at the end of the first term of 2010 via electronic survey and VLE access logs, as well as during the term via documenting staff meeting discussions.

The results indicate that the e-Lecturers have a positive attitude towards blended learning and that they believe the use of VLEs has value in the third and fourth year undergraduate occupational therapy curriculum.

The VLEs were used primarily for posting of lecture materials (which was consistent with the reflection of the 2009 academic year), but there was more evidence of using the communication tools and active learning tools during the first term of 2010. Synchronous tools such as chat rooms and class tests were disrupted by inefficiency of the server and networks hosting the VLE platform, which contributed to e-Lecturers reporting frustration. The absence of plagiarism monitoring software was highlighted and the need for this was noted.

Recommendations for the second cycle of the PAR:

- The migration of the VLE platform to a larger, higher processor server.
- The School of Therapeutic Science e-Learning Project team should facilitate the e-Lecturers to use a broader scope of the VLE tools by demonstrating the potential of such tools within the occupational therapy curriculum.
- The School of Therapeutic Science e-Learning Project should attempt to sustain the impetus of blended learning within the DOT by presenting the results of this cycle to the e-Lecturers and triggering the start of the second cycle.

The use of blended learning in undergraduate occupational therapy PBL curriculum delivery has indicated full initial e-Lecturer uptake and implementation in the DOT. Though there is still ongoing scope for development, the initial study indicated a sense of success and ownership by the eLecturers.

## REFERENCES

[1] M. M. Cockbain, C. M. Blyth, C. Bovill, and K. Morss, "Adopting a blended approach to learning: Experiences from Radiography at Queen Margaret University, Edinburgh," *Radiography,* vol. In Press, Corrected Proof.

[2] A. Heinze and B. Heinze, "Blended e-learning skeleton of conversation: Improving formative assessment in undergraduate dissertation supervision," *British Journal of Educational Technology,* vol. 40, pp. 294-305, 2009.

[3] J. M. Keller, "First principles of motivation to learn and e3-learning," *Distance Education,* vol. 29, pp. 175-185, 08 2008.

[4] R. McCannon, D. Robertson, J. Caldwell, C. Juwah, and A. Elfessi, "Students' perceptions of their acquired knowledge during a problem based learning case study," *Occupational Therapy in Health Care,* vol. 18, pp. 13-28, 2004.

[5] B. Jung, J. Tryssenaar, and S. Wilkins, "Becoming a tutor: exploring the learning experiences and needs of novice tutors in a PBL programme," *Medical Teacher,* vol. 27, pp. 606-612, 2005.

[6] N. P. Kenny and B. L. Beagan, "The patient as text: a challenge for problem-based learning," *Medical Education,* vol. 38, pp. 1071-1079, 2004.

[7] R. McCannon, D. Robertson, J. Caldwell, C. Juwah, and A. Elfessi, "Comparison of clinical reasoning skills in occupational therapy students in the USA and Scotland," *Occupational Therapy International,* vol. 11, pp. 160-176, 2004.

[8] R. Ellaway and K. Masters, "AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment," *Medical Teacher,* vol. 30, pp. 455-473, 2008.

[9] K. Masters and R. Ellaway, "e-Learning in medical education Guide 32 Part 2: Technology, management and design," *Medical Teacher,* vol. 30, pp. 474-489, 2008.

[10] J. Sandars and C. Haythornthwaite, "New horizons for e-learning in medical education: ecological and Web 2.0 perspectives," *Medical Teacher,* vol. 29, pp. 307-310, 2007.

[11] "Blackboard Home," http://www.blackboard.com, 12/05/2010: Blackboard Inc.

[12] "Moodle Home," http://moodle.org, 12/05/2010: Moodle Trust.

[13] E. Byrne and S. Sahay, "Participatory Design for Social Development: A South African Case Study on Community-Based Health Information Systems," *Information Technology for Development,* vol. 13, pp. 71-94, 2007.

[14] S. Kemmis and R. McTaggart, "Participatory Action Research," in *Handbook of Qualitative Research*, 2nd ed, N. Denzin and Y. Lincoln, Eds. California: Sage Publications Ltd., 2000, pp. 567-606.

[15] G. Kielhofner, *Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice*. Philidephia: F.A. Davis Company, 2006.

[16] J. W. Creswell, *Research Design: Qualitative, Quantitative and Mixed methods Approaches*, 2nd ed. California: SAGE Publications, 2003.

# Chapter 3. Paper 2

## 3.1. Introduction to paper 2

Paper 2 presents the first of the micro-level studies of the thesis (Figure 1.6 p.36). The lecturers of the DOT expressed concerns early in the PAR as to the digital literacy and access to resources of the students entering the undergraduate occupational therapy degree. Ensuring that students are orientated to the VLE and the online resources available at WITS was an attempt to ensure equal access for all students. Students attended a computer laboratory session during which they were taken step-by-step through the VLE and online resources. Many students expressed frustration at having to wait for students with poorer digital literacy on one end, while others felt pressured to keep up and soon became 'lost'. Paper 2 reviews the literature pertaining to BL and considers the digital literacy component of the skills dimension of 'digital apartheid' particularly in the context of first-year students. The concept of a WebQuest was originally proposed by Bernie Dodge[187] as an interactive BL activity that motivates students through the challenge of the quest. A WebQuest allows students to be self-paced and self-regulate their learning. The orientation session was redesigned as a short-term WebQuest from 2015. Students repeating the first year did not re-attend this orientation to the online resources session as they were already familiar with these, thus the results only reflect first-time first-year students.

From the results we learnt that the majority of first-year students are primed for blended learning in terms of access to the internet and computing hardware and that they rate themselves at a mode of 8 on a 10-point scale for their digital media proficiency. The importance of the 'just right challenge' in ensuring the level of difficulty of a BL activity was demonstrated in that the cohort who rated the difficulty of the WebQuest as 'just right' & 'easy' found it the most enjoyable, felt it made the learning process more interesting and found the WebQuest to be beneficial to learning. Despite some students experiencing technical difficulties they generally felt that the WebQuest was fun and game-like. The study indicates that a WebQuest to support the students' digital and academic literacy may be beneficial to those students who found it hard to navigate large documents and complete the plagiarism task.

## 3.2. Paper 2: First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment

Barnard-Ashton PM, van der Linde J, Rothberg A and P McInerney. First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment. *South African Journal of Occupational Therapy* 2018, 48(2): 3-11

Status: Published – Copyright is retained by the authors with this journal.

SCIENTIFIC ARTICLES

http://dx.doi.org/10.17159/23103833/2018/vol48n2a2 ISSN On-line 2310-3833

South African Journal of Occupational Therapy Aug, vol. 48 no. 2: 3-11

Creative Commons License 4.0

# First-year students' experience of a WebQuest to explore the University's online resources and virtual learning environment

**Paula Barnard-Ashton, BSc OT (Wits),MSc OT (Wits)**
Manager and Lecturer; eFundanathi – Learn with Us; School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand. Affiliated to the Department of Occupational Therapy

**Janine van der Linde, B OT (UFS), MSc OT (Wits)**
Lecturer and Instructional Designer eFundanathi – Learn with Us; School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand. Affiliated to the Department of Occupational Therapy

**Alan Rothberg, MBBCh (Wits), FCPaed (SA), PhD (Wits)**
Associate Professor; School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand

**Patricia McInerney, BSc Nursing (Wits), Dip N Ed (Wits), MSc Nursing (Wits), PhD (Wits)**
Associate Professor, Centre for Health Science Education, Faculty of Health Sciences, University of the Witwatersrand

**ABSTRACT**

*First-year students present with diverse digital literacy skills. Orientation to online tools and resources via a WebQuest was introduced as a novel modality to allow students to work at their own pace. Occupational therapy and physiotherapy students (N=383) over three consecutive academic years completed the WebQuest. A descriptive survey design was used to investigate the students' electronic media preferences and their perceptions of the WebQuest. The students (n=250) reported preference for personal computing and home-based internet, and rated their electronic media proficiency as very good. The WebQuest was seen as beneficial to their learning and the difficulty level of the WebQuest was "just right". The majority of the students felt that the WebQuest made the learning process more interesting, but were more ambivalent regarding their enjoyment of the WebQuest, possibly due to technical issues and experiencing it as being time consuming. Overall the WebQuest was a successful modality for orientating the students to the online tools and resources of the University.*

**Key words:** WebQuest; blended learning; e-learning; digital literacy; occupational therapy; physiotherapy

## INTRODUCTION

Typically, students enter the higher education environment with a diversity of computing and technology experience due to varied high school exposure and socio-economic circumstances[1,2]. It is therefore important to establish their digital literacy and access to technology to ensure their readiness for the Blended Learning (BL) components of the curriculum[1,3]. Students should also be orientated to the online tools and resources available at the University during the initial weeks of their first year to ensure they all have equal understanding and skill for participating in academic tasks[3]. Traditionally the first-year occupational therapy and physiotherapy students have been attending an orientation workshop in a computer laboratory which takes them step-by-step through how to access and use the Virtual Learning Environment (VLE), the online library resources, anti-plagiarism software and their student email accounts. During the orientation workshops, the proficient students tended to be bored with having to wait for others to catch up, and the inexperienced students were stressed by perceived pressure to hurry up when they did not understand the work. It became obvious that the step-by-step, face-to-face approach was frustrating most of the students. The opportunities afforded by using a WebQuest were explored as a possible way to 'practice what we preach' by using interactive e-learning in the orientation session.

### Blended Learning and Digital Literacy

Blended Learning (BL) is widely considered to be the integration of traditional face-to-face teaching methods with e-learning activi- ties in a coordinated manner to address the learning outcomes of a course[3,4]. Health science education has adopted BL as a strategy to address the intense learning demands of the rapid technological advancement and ever-expanding knowledge within the health professions[5]. Blended Learning as an active learning style is thought to improve a students' critical and analytical thinking, application of new knowledge in clinical practice and reflective practice for higher order thinking[4]. Ocak and Topal[5] found that BL in an anatomy course allows for anywhere, any-time access to resources, which facilitated students' freedom to control their learning. Despite some students being limited by poor internet connectivity, they were generally positive about the BL course and were comfortable with BL being introduced in other courses. Evidence suggesting improved student performance in courses implementing BL is growing, particularly when correlating active participation in the online activities such as engagement in online discussion forums, with student assessment[6-8]. A frequently cited concern in the implementation of BL courses however, is the digital literacy skills of the students[9].

Papageorgiou and Callaghan1 critiqued the marginalisation of some students entering the South African higher education system due to poor technology preparedness created by inequality within



© SA Journal of Occupational Therapy

the high school system despite two decades of post-apartheid democracy and development. They strongly advised academics to be aware of advantaging some students and marginalising others when introducing information technology-dependent curricula, and recognise that students will need to develop these skills in order to cope in their professions once qualified. Snowball and Mostert[3] supported this concern when introducing BL as a response to the teaching and learning demands created by massification. Their study recommended the evaluation of student digital literacy skills on admission, and the provision of additional support where needed. They demonstrated that first-year students' skills developed rapidly, and uptake of participation on the VLE peaked prior to assignment and examination dates.

Digital literacy can impact online reading literacy. Wu and Peng[10] found that teenagers who had good online navigation skills and engaged in purposeful information-seeking habits while online, were more likely to have better online reading literacy than those who engaged in more social online behaviours. Pak[11] became concerned with the digital literacy skills of her students who were typically from low socio-economic backgrounds. Of particular note was her observation that while modern students are proficient in social media related skills, this does not correlate with academic digital ability. She created a WebQuest to address this gap within the context of an English language course. Leung and Unal[12] found that WebQuests support the development of digital literacy, irrespective of the topic and content, further supporting this teaching strategy.

### What is a WebQuest?

The concept of the WebQuest was pioneered by Dodge[13] as a tool to make online learning more engaging and efficient for students. Dodge's most cited definition is: "A WebQuest is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the internet."[13 (web)]

This simplistic and somewhat nebulous definition was expanded during a more recent interview with Dodge:

"A WebQuest is built around an engaging and doable task that elicits higher order thinking of some kind. It's about doing something with information. The thinking can be creative or critical, and involve problem solving, judgment, analysis, or synthesis. The task has to be more than simply answering questions or regurgitating what's on the screen. Ideally, the task is a scaled down version of something that adults do on the job, outside school walls"[14:2].

March[15] worked closely with Dodge in developing the process and attributes of WebQuests, as well as the educational theory supporting the use of this teaching strategy. The constructivist and technology-enhanced approach to learning formed the foundation of the attributes required to design high quality WebQuests[15,16].

The cornerstone of a well-designed WebQuest is the nature of the overall activity and tasks. The tasks should not merely require the student to present the information sourced from the internet, but rather apply it to a problem, challenge or skill[16,17]. The task stimulates the student's critical thinking, approach to problem-solving and judgement, and action in the task context is required[14,15,17]. Consequently, WebQuests are deemed to motivate students through presenting an authentic real-world challenge[16-18]. Aina and Sofowora[18] surveyed 90 students to see whether they found the WebQuest to be beneficial to their learning, resulting in 49.1% strongly agreeing and 23.6% somewhat agreeing with the statement. Students reported that the nature of the WebQuest helped them concentrate on the learning activities, thus improving knowledge retention[18].

The primary justification for selecting the WebQuest as the mode of delivery is that it is said to drive the intrinsic motivation of the student to participate in the learning process as it stimulates interest in the content and enhances enjoyment of the challenge that the WebQuest presents[19]. Kobylinski[20] and Unal *et al.*[17] emphasised that the design of the WebQuest plays an important role as it can impact the students' enjoyment and thus motivation to participate. In the Kobylinski[20] study, the WebQuest was deemed to be simplistic and not modern, impacting the students' interest in participating. Kobylinski[20] surveyed the student experience of a WebQuest designed to develop the English writing skills of first year students, and found that the students perceived it to be ineffective and less motivating than their self-directed research into the topic. He however acknowledged limitations in the rudimentary design, restrictive format, and the cumbersome tasks involved in this particular WebQuest. This raises the issue of the level of challenge present in the WebQuest, as establishing the just-right challenge or degree of difficulty of the learning tasks is a key driver of students' internal motivation[21]. Therefore, in order to investigate the impact of using a WebQuest of the students' intrinsic motivation, one can consider the student experiences in terms of enjoyment, finding the process interesting and how difficult the WebQuest was[19-21].

While WebQuests are popular in secondary school education[22,23] and undergraduate teacher training[24,25], there is a paucity of investigation into the use of WebQuests in health professionals' education, which further seems confined to nursing education. Sanford *et al.*[26] propose two detailed examples of WebQuests which could be used in the continued professional development of nurses, but give no evidence of having executed either example in practice. Drozd and O'Donoghue[27] implemented a short-term WebQuest with 11 undergraduate nursing students. Four students did not complete the WebQuest, either due to poor computer skills or late registration for the course. The seven students who completed the WebQuest were positive about the learning process, the novelty and their knowledge gain. It was however emphasised that WebQuests should be launched face-to-face to ensure student understanding of and access to technology, and that direct alignment to the curriculum would make it more relevant[27]. In an era in which BL is prominent in higher education, it is surprising that health professionals' education is relatively oblivious to this tool.

WebQuests can be categorised as short-term or long-term, depending on the duration and complexity of the WebQuest[13,17]. Short-term WebQuests, as applied in this study, can be completed in a few sessions, focusing more on knowledge gain and understanding than on higher order application[13,17]. First-year students during the orientation sessions were frustrated at the varying pace of the stepby-step, face-to-face process where some students were slower and required more assistance due to poorer digital literacy and others were ahead and had to wait. This demotivated students at both ends of the spectrum. The pace of the step-by-step, face-to-face process was difficult for the presenters to manage (especially with larger classes) despite the involvement of support facilitators. The WebQuest was proposed as an option to alleviate such tensions, but it was important to understand the digital literacy of the students as they entered higher education and to determine whether the WebQuest as a tool was beneficial to learning and stimulated the students' internal motivation to participate through the self-paced nature and 'gamification' process[18,19].

The study asks two research questions: 1) Are the first-year students entering therapeutic sciences degree courses adequately prepared and do they have adequate access to meet the blended learning demands of their curriculum (digital literacy)? 2) Is a WebQuest a tool that improves students' motivation to participate in the learning process and do they perceive it to be beneficial to learning?

## METHOD

The objectives of the study were to investigate:

- The students' personal computing access and perceived digital literacy on entrance to the first year of study.
- Their experiences of the WebQuest in terms of perceived benefit to learning
- The degree to which the WebQuest stimulated the students' intrinsic motivation through their perceived enjoyment, whether the WebQuest made learning interesting, and the degree of difficulty of the WebQuest.


© SA Journal of Occupational Therapy

This study used a cross-sectional, descriptive quantitative survey design to evaluate the use of the WebQuest to orientate the first-year occupational therapy and physiotherapy students to the University's online resources. Ethical clearance was obtained from the institution's human research ethics committee (certificate M141168), and all occupational therapy and physiotherapy students who engaged with the WebQuest were asked to participate in the study. Informed consent was electronically captured for the survey results to be used for research purposes after verbal explanation of the purpose of the study during the WebQuest introduction session.

## Participants

The population of this study are the first-year occupational therapy and physiotherapy students from three consecutive years. This is a public funded University and as such students are admitted in accordance with an admissions policy which promotes transformation. Sixty percent of students are selected from top-achieving students at rural schools, low or no-fee paying schools or top-achieving African and coloured students[28]. Between 60 and 70 students are admitted for each of these degrees each year. The student body in these two degrees are predominantly female although there is a greater proportion of male students in the Physiotherapy classes. Six groups of students participated in the WebQuest over three consecutive academic years:

- 2015 first-year Occupational Therapy group: enrolment of 68 students ($OT_{y1}$)
- 2015 first-year Physiotherapy group: enrolment of 61 students ($PT_{y1}$)
- 2016 first-year Occupational Therapy group: enrolment of 65 students ($OT_{y2}$)
- 2016 first-year Physiotherapy group: enrolment of 55 students ($PT_{y2}$)
- 2017 first-year Occupational Therapy group: enrolment of 70 students ($OT_{y3}$)
- 2017 first-year Physiotherapy group: enrolment of 64 students ($PT_{y3}$)

## Intervention

At the start of the academic year a two-hour workshop is scheduled to introduce the first-year students to the VLE and other university online resources. A WebQuest was designed using a 'Sherlock Holmes'[29] theme via storyboarding software[30] that is Sharable Content Object Reference Model (SCORM) compliant[31]. The first and second authors designed the tasks and with the assistance of a graphic designer, compiled the WebQuest from concept to an exportable storyboard over a five-week period. The SCORM file was then imported into a test class on the VLE, and was tested together with the supporting documents and assignments to ensure the flow and test all hyperlinks. The WebQuest was imported into the pharmacy first-year class for piloting. The 94 pharmacy students completed the WebQuest one week prior to the $OT_{y1}$ and $PT_{y1}$. The WebQuest remained unchanged between the pilot and the $OT_{y1}$ and $PT_{y1}$.

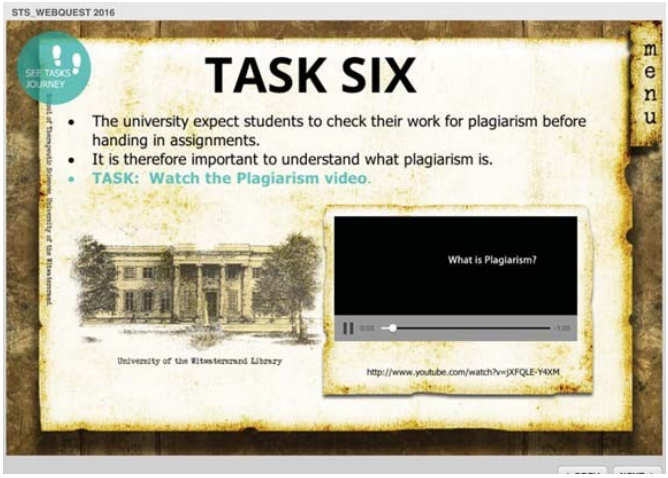


Figure 1: Screenshot of the WebQuest task six (plagiarism video)

This short-term WebQuest consisted of 12 tasks which included updating their VLE profile page, downloading and reading important documents such as the 'social-media policy', accessing the professional course 'Libguide' on the library portal, watching a video on plagiarism (*Figure 1*), writing a paragraph about plagiarism and submitting it to the plagiarism detection online programme, and completing a word puzzle and a quiz. The WebQuest was designed to orientate students to the university's online resources and policies and to create understanding of academic issues around plagiarism.

The WebQuest was introduced to the students in a computer laboratory (*Figure 2*) by one presenter and three facilitators who collaborated on the design of the WebQuest. The introduction ensured that all students could access the VLE and open the WebQuest. It could be completed within the 2-hour workshop time in the computer laboratory, but students were given the option to leave and do it in their own time. They were free to work individually or in informal groups, but all students were required to complete the WebQuest within six-weeks, although no marks were associated with the activity.



Figure 2: Students during the WebQuest in the computer laboratory

The students were introduced to the study during the WebQuest introduction, the purpose was explained and assurance given that participation in the study was voluntary with no consequence for non-participation. Students were assured that their responses would remain confidential and that the only identifying information would be the degree for which they were enrolled. An electronic informed consent was included as a link via an electronic form that allowed students to download a copy of their consent. This consent form was on a different platform to the survey.

## Extraneous variables

While all effort was made to control for extraneous variables, the facilitators of the intervention noted that the $OT_{y2}$ was in an unfamiliar computer venue which led to a delayed start to the session. Poor projection visibility in this venue created additional difficulty in following the introductory presentation. This caused a general level of frustration and apathy among the $OT_{y2}$ students.

## Survey

A purpose-designed survey instrument, informed by the literature on WebQuest research[18,19], was created using REDCap[32], which securely captures and allows management of the data via a webbased interface. The survey consisted of:

- the student number was requested as an identifier (optional)
- two demographic questions to verify cohort allocation (registered degree and year of study);


© SA Journal of Occupational Therapy

- two multi-option categorical questions related to the students' personal computing environment (type of device and mode of internet access);
- students' rating of their electronic media proficiency on an ordinal scale from 1 (very poor) to 10 (excellent);
- four nominal scale questions to investigate their experience of the WebQuest, namely: benefit to learning, made learning process interesting, enjoyment of the WebQuest and the level of difficulty of the WebQuest. The questions and scales were based on other surveys from the WebQuest literature[12,18,20];
- two optional, short answer questions that were included to support responses.

The survey was peer-reviewed by four lecturers with experience in blended learning and survey-based research for content validity and structure. The first-year pharmacy students from 2015 participated in the WebQuest during their orientation week and completed the survey as a pilot. It was apparent that there were duplicate responses, thus a field to enter a student number was included. It was further apparent that there were fewer consent responses from the pharmacy students than survey responses. The student number was thus also included in the informed consent in order to cross-reference surveys to consent given. The survey was shortened by removing two questions which were covered by the open-ended questions. The survey was the final task of the WebQuest, but students were given the option to 'skip' the task should they not consent to participate in the study.

A neutral research assistant cleaned the data in that any survey responses without consent or that were duplicate responses were removed from the data and the student numbers removed prior to the researchers analysing the data. The data from the six student groups were descriptively analysed using non-parametric statistics. Categorical data were analysed for significance using the Freeman-Halton extension of the Fisher exact probability test (FE) or the Chi-square test ($\chi^2$) as appropriate, based on category frequency. The p-value was analysed using the Chi-Square test ($\chi^2$) if over 80% of categories had a frequency <5, and the Fisher Exact (FE) when less than 80% was evident. Ordinal data were analysed using the Kruskal-Wallis k=3 Test[33,34]. A p-value ≤ 0.05 was considered significant.

The short response data were open coded and analysed for patterns of frequently cited experiences using MaxQDA version 12.1.4 software[35]. Frequently cited codes for each question were reported on.

# RESULTS

The WebQuest was completed by 383 first year Occupational Therapy and Physiotherapy students over a three-year period (2015-2017), of which 65.3% completed the survey. The response rates per group were (n(%)): $OT_{y1}$ 57(83.8%); $PT_{y1}$ 38(62.3%); $OT_{y2}$ 45(69.2%); $PT_{y2}$ 40(72.7%); $OT_{y3}$ 47(67.1%) and the lowest response rate $PT_{y3}$ 23(35.9%).

The students' preferred device for accessing electronic media and their connectivity preference at the start of their undergraduate career is reflected in *Table I* (this page) and *Table II* (page 7) respectively. There were no significant differences in computing preferences when compared year on year within each profession, and between profession groups per year, except when comparing the preferred computing devices of the third year $OT_{y3}$: $PT_{y3}$ ($p=0.023$) where the $OT_{y3}$ had significantly higher preference for personal computers/ laptops. This indicates that the groups are comparable in terms of technology preferences.

The majority of the students preferred using their personal computer/laptop (64.8%) and had access to home based internet (66.8%). Of note is the small number of students (<1%) who have no access to a device or the internet.

In rating their computer or electronic media proficiency (*Table III* (page 7) there was no significant difference between the groups, with a total mean rating of m=7.61 on a 10-point scale, with a mere 19 (7.6%) students rating their proficiency at five or less over the three years of the study.

The students' perception of benefit to learning (*Table IV* on page 7) showed that more than half of the students (56.2%) rated the benefit to learning as good.

The students' perception of how difficult they felt the WebQuest was (*Table V* page 8) is important to establishing the impact it may have on the student participation. Two-thirds of the students perceived the level of difficulty of the WebQuest to be 'just right' (65.2%).

In order to investigate the WebQuest's role in the intrinsic motivation to learn, the students' perception of enjoyment of the WebQuest and whether it made the learning process more interesting was surveyed (*Table VI* pge 8). The students were relatively evenly distributed between being undecided (39.4%) and enjoying (44.6%) the WebQuest, with the Occupational Therapy groups showing significantly different profiles of enjoyment from one another. Most students (62.9%) considered that the learning process was made more interesting through the WebQuest.

**Table I: Students' preferred computing devices for accessing electronic media**

| | Personal computer/ laptop | Computer at library/public computer | Tablet computing device | Mobile device | More than one | None | Year on Year comparison | |
|---|---|---|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) | | $\chi^2$ (p-value) / FE p-value |
| $OT_{y1}$ n=57 | 39 (68.4) | 10 (17.5) | 10 (17.5) | 23 (40.4) | 16 (36.8) | 0 (0.0) | $OT_{y1:y2}$ | 0.585 (1.9) |
| $OT_{y2}$ n=45 | 33 (73.3) | 5 (11.1) | 4 (8.9) | 17 (37.8) | 9 (20.0) | 0 (0.0) | $OT_{y2:y3}$ | 0.940 |
| $OT_{y3}$ n=47 | 30 (63.8) | 3 (6.4) | 4 (8.5) | 17 (36.2) | 6 (12.8) | 0 (0.0) | $OT_{y1:y3}$ | 0.428 (2.8) |
| **TOTAL** $N_{OT}=149$ | 102 (68.5) | 18 (12.1) | 18 (12.1) | 57 (38.3) | 31 (20.8) | 0 (0.0) | | |
| $PT_{y1}$ n=38 | 26 (68.4) | 9 (23.7) | 10 (26.3) | 16 (42.1) | 13 (34.2) | 1 (2.4) | $PT_{y1:y2}$ | 0.196 (4.7) |
| $PT_{y2}$ n=40 | 27 (67.5) | 7 (17.5) | 2 (5.0) | 14 (35.0) | 7 (17.5) | 0 (0.0) | $PT_{y2:y3}$ | 0.075 |
| $PT_{y3}$ n=23 | 7 (30.4) | 6 (26.1) | 4 (17.4) | 9 (39.1) | 3 (13.0) | 0 (0.0) | $PT_{y1:y3}$ | 0.483 |
| **TOTAL** $N_{PT}=101$ | 60 (59.4) | 21 (20.8) | 16 (15.8) | 39 (38.6) | 23 (22.8) | 1 (1.0) | | |
| **TOTAL OT+PT** $N_{all}=250$ | 162 (64.8) | 39 (15.6) | 34 (13.6) | 96 (38.4) | 54 (21.6) | 1 (0.4) | | |


© SA Journal of Occupational Therapy

**Table II: Students' preferred modality for access to the internet**

| | Internet at home | Internet at residence | Internet on campus | Mobile data | More than one | None | Year on Year comparison | |
|---|---|---|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) | | p-value ($\chi^2$)/ FE p-value |
| $OT_{y1}$ n=57 | 41 (71.9) | 7 (12.3) | 18 (31.6) | 11 (19.3) | 16 (28.1) | 1 (1.8) | $OT_{y1:y2}$ | 0.617 (1.8) |
| $OT_{y2}$ n=45 | 35 (77.8) | 4 (8.9) | 10 (22.2) | 12 (26.7) | 10 (22.2) | 0 (0.0) | $OT_{y2:y3}$ | 0.442 (2.7) |
| $OT_{y3}$ n=47 | 29 (61.7) | 6 (12.8) | 15 (31.2) | 8 (17.0) | 9 (19.1) | 0 (0.0) | $OT_{y1:y3}$ | 0.976 (0.2) |
| **TOTAL** $N_{OT}$=149 | 105 (70.5) | 17 (11.4) | 43 (28.9) | 31 (20.8) | 35 (23.5) | 1 (0.7) | | |
| $PT_{y1}$ n=38 | 27 (71.1) | 6 (15.8) | 16 (42.1) | 8 (21.1) | 13 (34.2) | 0 (0.0) | $PT_{y1:y2}$ | 0.692 |
| $PT_{y2}$ n=40 | 21 (52.5) | 8 (20.0) | 13 (32.5) | 4 (10.0) | 7 (17.5) | 1 (2.5) | $PT_{y2:y3}$ | 0.363 |
| $PT_{y3}$ n=23 | 14 (60.9) | 1 (4.3) | 10 (43.5) | 2 (8.7) | 4 (17.4) | 0 (0.0) | $PT_{y1:y3}$ | 0.571 |
| **TOTAL** $N_{PT}$=101 | 62 (61.4) | 15 (14.9) | 39 (38.6) | 14 (13.9) | 24 (23.8) | 1 (1.0) | | |
| **TOTAL OT+PT** $N_{all}$=250 | 167 (66.8) | 32 (12.8) | 82 (32.8) | 45 (18.0) | 59 (23.6) | 2 (0.8) | | |

**Table III: Students' perceived computer/electronic media competence**

| | Range | Mode | Mean (SD) | Kruskal-Wallis Test k=3 p-value |
|---|---|---|---|---|
| $OT_{y1}$ n=57 | 3-10 | 8 | 7.95 (1.41) | |
| $OT_{y2}$ n=45 | 1-10 | 7 | 7.24 (1.71) | 0.123 |
| $OT_{y3}$ n=47 | 5-10 | 8 | 7.75 (1.47) | |
| $PT_{y1}$ n=38 | 4-10 | 8 | 7.42 (1.41) | |
| $PT_{y2}$ n=40 | 5-10 | 8 | 7.73 (1.45) | 0.403 |
| $PT_{y3}$ n=23 | 4-9 | 8 | 7.30 (1.26) | |

**Table IV: Students' perceptions of the WebQuest as being beneficial to learning**

| | Poor | Satisfactory | Good | Excellent | Year on Year comparison | |
|---|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) | | p-value ($X^2$)/ FE p-value |
| $OT_{y1}$ n=57 | 0 (0.0) | 9 (15.8) | 36 (63.2) | 12 (21.1) | $OT_{y1:y2}$ | 0.043* |
| $OT_{y2}$ n=44 | 2 (2.2) | 14 (31.8) | 24 (54.5) | 4 (9.1) | $OT_{y2:y3}$ | 0.926 |
| $OT_{y3}$ n=47 | 3 (6.4) | 15 (31.9) | 23 (48.9) | 6 (12.8) | $OT_{y1:y3}$ | 0.035* |
| **TOTAL** $N_{OT}$=148 | 5 (3.4) | 38 (25.7) | 83 (56.1) | 22 (14.9) | | |
| $PT_{y1}$ n=38 | 0 (0.0) | 14 (36.8) | 19 (50.0) | 5 (13.2) | $PT_{y1:y2}$ | 0.172 |
| $PT_{y2}$ n=40 | 2 (5.0) | 10 (25.0) | 26 (65.0) | 2 (5.0) | $PT_{y2:y3}$ | 0.112 |
| $PT_{y3}$ n=23 | 1 (4.3) | 4 (17.4) | 12 (52.2) | 6 (26.1) | $PT_{y1:y3}$ | 0.156 |
| **TOTAL** $N_{PT}$=101 | 3 (3.0) | 28 (27.7) | 57 (56.4) | 13 (12.9) | | |
| **TOTAL OT+P** $N_{all}$=249 | 8 (3.2) | 66 (26.5) | 140 (56.2) | 35 (14.1) | | |

Across all four nominal scale questions there was no difference in the results of the Physiotherapy groups. The $OT_{y2}$ and $OT_{y3}$ were similar, but significantly different from $OT_{y1}$ for benefit to learning, difficulty and making the learning process more interesting. The Occupational Therapy students' enjoyment of the WebQuest appears to wane each year with a significant difference noted between each year.

The two optional, short open-ended questions explored aspects the students' 'liked' versus 'disliked' aspects of the WebQuest (217 responses). Students across the groups commented that this was a novel way to learn (n=22), with it being like a game (n=17), which made it fun (n=71). They liked that it was self-paced learning, that taught them relevant and useful information that they would be able to apply in their course (n=98).

*People are more positive about learning when they see the learning process as a game and I think [the] WebQuest was successful in allowing people to have fun while still learning valuable information.* (Student 140 $PT_{y1}$)

*Instead of the controversial lecturer standing in front of the class type*


© SA Journal of Occupational Therapy

**Table V: Students' perceptions of the level of difficulty of WebQuest**

| | Hard | Just right | Easy | Year-on-year comparison | |
|---|---|---|---|---|---|
| | n (%) | n (%) | n (%) | | p-value ($X^2$)/ FE p-value |
| $OT_{y1}$ n=55 | 1 (1.18) | 36 (65.5) | 18 (32.7) | $OT_{y1:y2}$ | 0.004* (10.9) |
| $OT_{y2}$ n=43 | 8 (18.6) | 29 (67.4) | 6 (14.0) | $OT_{y2:y3}$ | 0.595 (1.0) |
| $OT_{y3}$ n=45 | 7 (15.6) | 28 (62.2) | 10 (22.2) | $OT_{y1:y3}$ | 0.029* |
| **TOTAL** $N_{OT}$=143 | 16 (11.2) | 93 (65.0) | 34 (23.8) | | |
| $PT_{y1}$ n=38 | 7 (18.4) | 20 (52.6) | 11 (28.9) | $PT_{y1:y2}$ | 0.159 (3.7) |
| $PT_{y2}$ n=40 | 3 (7.5) | 29 (72.5) | 8 (20.0) | $PT_{y2:y3}$ | 0.295 |
| $PT_{y3}$ n=23 | 4 (17.4) | 17 (73.9) | 2 (8.7) | $PT_{y1:y3}$ | 0.167 |
| **TOTAL** $N_{PT}$=101 | 14 (13.9) | 66 (65.3) | 21 (20.8) | | |
| **TOTAL OT+PT** $N_{all}$=244 | 30 (12.3) | 159 (65.2) | 55 (22.5) | | |

**Table VI: Students' perceptions of the WebQuest for intrinsic motivation**

| **Enjoyed the learning process** | | | | | |
|---|---|---|---|---|---|
| | **no** | **undecided** | **yes** | **Year-on-year comparison** | |
| | n (%) | n (%) | n (%) | | p-value ($X^2$)/ FE p-value |
| $OT_{y1}$ n=57 | 2 (3.5) | 18 (31.6) | 37 (64.9) | $OT_{y1:y2}$ | 0.000* |
| $OT_{y2}$ n=45 | 5 (11.1) | 29 (64.4) | 11 (24.4) | $OT_{y2:y3}$ | 0.042* (6.3) |
| $OT_{y3}$ n=47 | 10 (21.3) | 18 (38.3) | 19 (40.2) | $OT_{y1:y3}$ | 0.006* (10.3) |
| **TOTAL** $N_{OT}$=149 | 17 (11.4) | 65 (43.6) | 67 (45.0) | | |
| $PT_{y1}$ n=37 | 6 (16.2) | 14 (37.8) | 17 (45.9) | $PT_{y1:y2}$ | 0.160 (3.7) |
| $PT_{y2}$ n=40 | 14 (35.0) | 13 (32.5) | 13 (32.5) | $PT_{y2:y3}$ | 0.062 (5.6) |
| $PT_{y3}$ n=23 | 3 (13.0) | 6 (26.1) | 14 (60.9) | $PT_{y1:y3}$ | 0.525 (1.3) |
| **TOTAL** $N_{PT}$=100 | 23 (23.0) | 33 (33.0) | 44 (44.0) | | |
| **TOTAL OT+PT** $N_{all}$=249 | 40 (16.1) | 98 (39.4) | 111 (44.6) | | |
| **Makes the learning process more interesting** | | | | | |
| | **no** | **undecided** | **yes** | **Year-on-year comparison** | |
| | n (%) | n (%) | n (%) | | p-value ($X^2$)/ FE p-value |
| $OT_{y1}$ n=56 | 0 (0.0) | 10 (17.9) | 46 (82.1) | $OT_{y1:y2}$ | 0.000* |
| $OT_{y2}$ n=43 | 5 (11.6) | 18 (41.9) | 20 (46.5) | $OT_{y2:y3}$ | 0.781 |
| $OT_{y3}$ n=46 | 4 (8.7) | 17 (37.0) | 25 (54.3) | $OT_{y1:y3}$ | 0.003* |
| **TOTAL** $N_{OT}$=145 | 9 (6.2) | 45 (31.0) | 91 (62.8) | | |
| $PT_{y1}$ n=38 | 2 (5.3) | 10 (26.3) | 26 (68.4) | $PT_{y1:y2}$ | 0.150 (3.8) |
| $PT_{y2}$ n=40 | 8 (20.0) | 9 (22.5) | 23 (57.5) | $PT_{y2:y3}$ | 0.931 |
| $PT_{y3}$ n=22 | 3 (13.6) | 5 (22.7) | 14 (63.6) | $PT_{y1:y3}$ | 0.527 |
| **TOTAL** $N_{PT}$=100 | 13 (13.0) | 24 (24.0) | 63 (63.0) | | |
| **TOTAL OT+PT** $N_{all}$=245 | 22 (9.0) | 69 (28.2) | 154 (62.9) | | |


© SA Journal of Occupational Therapy

*of learning it actually was a total contrast of what learning is and that made it very intriguing.* (Student 262 $OT_{y3}$)

*1) It was self-learning versus just being lectured. 2) Involved a lot of participation from my part. 3) I was not spoon fed which made the learning more meaningful.* (Student 145 $PT_{y2}$)

Students reported that the WebQuest instructions were confusing or unclear (n=16), yet 14 students reported the instructions were clear. Students felt it was too time consuming (n=53) and that they did not enjoy reading the long policy documents (n=29). There were reports of technical difficulties (n=42) particularly with the $OT_{y2}$ and $OT_{y3}$ cohorts: internet connectivity; the browser freezing; students finding it difficult to navigate between the tabs; and the WebQuest not saving their progress.

*It was more the technological difficulties that gave problems such as internet connection.* (Student 71 $OT_{y2}$)

*It took up quite a bit of time simply because internet was slow and some features did not work on some devices. It was a lot of work just to go through things which were rather easy to figure out anyway. Although innovative and fun, when it started to waste time, the originality turned into an irritation.* (Student 274 $OT_{y3}$)

# DISCUSSION

Blended Learning (BL) in South African universities is challenged by concerns that some students enter higher education with poor digital literacy skills due to unevenly distributed access to technology resources during their high school career[2]. Of interest in the present study and consistent with other research, is the high percentage who choose to use a personal computer/laptop and access electronic media via home-based internet, as well as the number of students who have more than one computing device and more than one modality of internet access[11]. Surprisingly, less than half the students indicated the use of a mobile device and mobile data as a preference. This does not imply that they do not have mobile devices, merely that they prefer other modalities for accessing electronic media, which may be a reflection on the relatively high cost of mobile data in South Africa[36]. It therefore supports the need for access to stable university-funded bandwidth. Despite common concerns about the digital literacy of first year students[1,2], the study groups were confident about their electronic media proficiency, which primes them for blended learning. Drozd and O'Donoghue[27] highlighted that the success of a WebQuest may be impacted by the students' access to computers and digital literacy skills, however, in this study, less than 1% of students were limited by access, and a small percentage of students felt that their electronic media proficiency was poor/average (7.6%). The readiness of these students suggests that WebQuests are a viable BL strategy in this population, but the difficulty of the WebQuest may be a factor. Overall, the students felt that the level of difficulty of the WebQuest was 'just right' (65.2%).

Similar to Aina and Sofowora[18], the Occupational Therapy and Physiotherapy students perceived the WebQuest as beneficial to their learning (70.3% rated it as 'good' or 'excellent'). For a WebQuest to be successful, it needs to be authentic and real-world[15] - which is validated in the student comments that the content of the WebQuest was meaningful and valuable and 62.9% felt the WebQuest made the learning process more interesting. Studies of the benefits of using WebQuests seldom consider the students' perceived enjoyment as a construct to investigate, rather adding minor anecdotal comment on observed indications that students have enjoyed it[19,27]. There were very few negative responses, but students were divided between being undecided (39.4%) and being positive (44.6%) concerning their enjoyment of the WebQuest.

The notable finding in this study is the results of the three Occupational Therapy student groups, which supports the relationship between perceived difficulty, enjoyment of the WebQuest, and the learning process being interesting as an indication of intrinsic motivation to participate, and in turn, in the perceived benefit of the WebQuest to learning. The $OT_{y1}$ (91.2%) felt that the difficulty of the WebQuest was just right and easy, significantly more than $OT_{y2}$ (81.4%) and $OT_{y3}$ (84.4%). This appears to associate with significantly higher enjoyment of the WebQuest by $OT_{y1}$ (64.9%) and 82.1% felt that the WebQuest made the learning process more interesting. The impact on their perception of the WebQuest as being beneficial to learning is evident in that 84.3% of $OT_{y1}$ felt it was good and excellent as opposed to only 63.6% of $OT_{y2}$ and 61.7% of $OT_{y3}$. The frustrations expressed by the students, particularly the technical difficulties experienced by $OT_{y2}$ and $OT_{y3}$ cohorts, and that all cohorts felt that the WebQuest was too long with too much reading, possibly accounts for the shift in enjoyment, as was described in the quote by Student 274 $OT_{y3}$ above. It is important to recognise that enjoyment is subjective and may not be directly correlated to students' finding the process interesting or learning from the experience.

The students' primary frustration was that some of the policy and guideline documents they had to download were too reading intensive. This possibly relates to the point at which required reading skills and comprehension 'ratchet up' between secondary and tertiary education, and the diversity of academic preparedness of our students, many of whom have experienced socio-cultural inequality[2]. They showed reluctance to engage with large documents, despite hyperlinked navigation of the document contents. These documents represent the prescribed readings that would be required throughout their undergraduate careers. This reflects the poor online/electronic reading literacy compared to paper-based reading literacy, and the impact of navigation and information seeking skills on reading[10].[1] Selection of prescribed readings should therefore take readability into account, and University documents could be designed to be more user-friendly. The online/electronic reading literacy of the students was not the focus of the study but has impacted the students' enjoyment of the WebQuest and indicates a possible area of concern in their academic readiness. This suggests that a WebQuest - focusing on information literacy and academic writing - could be developed for students to participate in should they feel they need it.

## Limitations of the Study

The limitations that were evident during this study were:

- The computer laboratory venue was not consistent between the groups which implies that the computers the students used to access the WebQuests may have had inconsistent processing power and internet bandwidth speeds.
- The study was not designed to compare the use of a WebQuest to a control teaching method, such as the traditional step-bystep workshop, as the survey questions relating to the student experience would not be applicable to both contexts, leaving little to compare.
- The study is confined to a single university setting. While the study was conducted over three years with relatively consistent findings, replicability is limited due to the WebQuest design being specific to the VLE and online resources available at this particular university. A similar WebQuest could however be modelled on the same tasks for use at other Universities.

# CONCLUSION

A WebQuest was designed to introduce first year Occupational Therapy and Physiotherapy students to BL and online tools and resources available within the University. The students indicated higher than anticipated access to computing devices and off-campus internet access, and perceived their electronic media proficiency to be very good. There was evidence of a relationship

[1] Note: This is a result of the current study as supported in the paper by Wu JY and Peng Y-C


© SA Journal of Occupational Therapy

between the degree of difficulty of the WebQuest to influence the intrinsic motivation of the students, and in turn impacting their perceived benefit of the WebQuest to their learning. Of concern was the students' reluctance to read lengthy documents possibly indicating that the online/electronic reading literacy of the students impacted their enjoyment of the WebQuest. Students found the WebQuest to be too long, indicating that revision of the tasks and scheduling appropriate time for completion should be explored. The WebQuest is considered to have achieved the desired skills and learning objectives, and the students experienced it as an interesting, creative and fun way to learn.

**Considerations for the future within this context include:** The WebQuest should be confined to a single laboratory session to combat the technical issues. Consideration should be given to reducing the overall length of the WebQuest and exploring design modifications which support ease of reading task instructions, while maintaining the learning objectives. A task on navigating large electronic documents to find pertinent information may be a valuable future addition. This study indicates that a dialogue should be opened with the University's central services involved in developing and publishing rules and guideline documents, regarding the readability and complexity of the documents they publish.

Further research into the relationship between students' perception of how difficult a WebQuest is and the impact it has on intrinsic motivation (as indicated by enjoyment and how it makes the learning process interesting) should be explored. While intrinsic motivation is viewed as improving student engagement with the content[20], further investigation to whether there is increased benefit to learning and if this translates into improved digital literacy skills, is warranted.

**Considerations for implementation of WebQuests in health professional education:** Exposing students to a WebQuest early in their academic career provides lecturers with the opportunity to explore the use of WebQuests in their BL modules, and has been shown to improve the students' digital literacy[12]. Short-term WebQuests create a fun context to learn and explore real-world issues within the context of the curriculum. In designing a WebQuest for health professionals' education, ensure that it has a fixed duration (one to two weeks) to drive consistent participation. Consider the availability of electronic devices and allocate time in a computer laboratory if one suspects that students' access to the WebQuest content will be influenced by the need to pay for mobile data. Students are entering higher education with a high level of computer and electronic media proficiency, which is creating more opportunities to use BL activities such as WebQuests to design for 21st century learning.

## REFERENCES


1. Papageorgiou E, Callaghan C. Resource scarcity and information technology: Issues and trends among first-year accounting students. South African Journal of Higher Education. 2014; 28(5): 1575-1592.
2. Kajee L, Balfour R. Students' access to digital literacy at a south african university: Privilege and marginalisation. Southern African Linguistics & Applied Language Studies. 2011; 29(2): 187-196.
3. Snowball J, Mostert M. Introducing a learning management system in a large first year class: Impact on lecturers and students. South African Journal of Higher Education. 2010; 24(5): 818-831.
4. McDonald PL, Straker HO, Schlumpf KS, Plack MM. Learning partnership: Students and faculty learning together to facilitate reflection and higher order thinking in a blended course. Online Learning. 2014; 18(4).
5. Ocak MA, Topal AD. Blended learning in anatomy education: A study investigating medical students' perceptions. EURASIA Journal of Mathematics, Science & Technology Education. 2015; 11(3): 647663.
6. Alghamdi A. Pedagogical implications of using discussion board to improve student learning in higher education. Higher Education Studies. 2013; 3(5): 68-80.
7. Umek L, Aristovnik A, Tomaževic N, Keržic D. Analysis of selected aspects of students' performance and satisfaction in a moodle-based e-learning system environment. EURASIA Journal of Mathematics, Science & Technology Education. 2015; 11(6): 1495-1505.
8. Mogus AM, Djurdjevic I, Suvak N. The impact of student activity in a virtual learning environment on their final mark. Active Learning in Higher Education. 2012; 13(3): 177-189.
9. Siemens G, Conole G. Special issue - connectivism: Design and delivery of social networked learning - editorial. International Review of Research in Open and Distance Learning. 2011; 12(3): 1-1.
10. Wu JY, Peng Y-C. The modality effect on reading literacy: Perspectives from students' online reading habits, cognitive and metacognitive strategies, and web navigation skills across regions. Interactive Learning Environments. 2016: 1-18.
11. Pak M. Developing academic technology skills with webquests. California English. 2015; 21(1): 11-13.
12. Leung CB, Unal Z. Advantages and disadvantages of classroom instruction with webquests: Connecting literacy and technology. Journal of Reading Education. 2013; 38(2): 31-38.
13. Dodge B. "Some thoughts about webquests". 1995. <http://webquest.org/sdsu/about_webquests.html> (27 June 2016)
14. Starr L. Wire side chat: Bernie dodge on webquests. Interview with Dodge B. Education World. 2012.
15. March T. The learning power of webquests. Educational Leadership. 2003; 61(4): 42-47.
16. Averkieva L, Chayka Y, Glushkov S. Web quest as a tool for increasing students' motivation and critical thinking development. Procedia - Social and Behavioral Sciences. 2015; 206: 137-140.
17. Unal Z, Bodur Y, Unal A, Kovacic Z. A standardized rubric for evaluating webquest design: Reliability analysis of zunal webquest design rubric. Journal of Information Technology Education. 2012; 11: 169-183.
18. Aina SA, Sofowora AO. Perceived benefits and attitudes of student teachers to web-quest as a motivating, creative and inquiry-based learning tool in education. Higher Education Studies. 2013; 3(5): 29-35.
19. Kurt S. Webquests and web 2.0 screen design. Journal of Technology in Human Services. 2010; 28(3): 178-187.
20. Kobylinski C. Student feedback on the effectiveness of using a webquest for an integrative skills course in a korean university. Contemporary Issues in Education Research. 2014; 7(1): 63-68.
21. Rodger S, Thomas Y, Greber C, Broadbridge J, Edwards A, Newton J, et al. Attributes of excellence in practice educators: The perspectives of australian occupational therapy students. Australian Occupational Therapy Journal. 2014; 61(3): 159-167.
22. Kurt S. Issues to consider in designing webquests: A literature review. Computers in the Schools. 2012; 29(3): 300-314.
23. Zheng R, Stucky B, McAlack M, Menchana M, Stoddart S. Webquest learning as perceived by higher-education learners. TechTrends: Linking Research and Practice to Improve Learning. 2005; 49(4): 41-49.
24. Alias N, SaedahSiraj, Rahman MNA, Ujang A, Gelamdin RB, Said AM. Research and trends in the studies of webquest from 2005 to 2012: A content analysis of publications in selected journals. Procedia - Social and Behavioral Sciences. 2013; 103: 763-772.
25. Haralson M, Hoaglund AMY, Birkenfeld K, Rogers B. Using webquests to support pre-service teachers' attitudes toward diversity: A model for the future. Education. 2016; 136(4): 413-420.
26. Sanford J, Townsend-Rocchiccioli J, Trimm D, Jacobs M. The webquest: Constructing creative learning. Journal of Continuing Education in Nursing. 2010; 41(10): 473-479 477p.
27. Drozd M, O'Donoghue J. The use of a webquest to support undergraduate nurses. Teaching and Learning in Nursing. 2007; 2(3): 63-67.
28. University of the Witwatersrand. Wits university revises its mbbch degree admissions policy. 2016. <https://www.wits.ac.za/media/ wits-university/faculties-and-schools/health-sciences/studentdocuments/undergraduate/Wits%20University%20Revised%20Health%20Sciences%20Admissions%20Policy.pdf> (November 08 2017)
29. Doyle AC. The adventures of sherlock holmes. George Newnes, Limited, 1901.




© SA Journal of Occupational Therapy

30. Articulate Global. Articlate storyline. 2 ed. New York: Articulate Global, Inc; 2015.
31. Masters K, Ellaway R. E-learning in medical education guide 32 part 2: Technology, management and design. Medical Teacher. 2008; 30: 474-489.
32. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (redcap)—a metadata-driven methodology and workflow process for providing translational research informatics support. Journal of Biomedical Informatics. 2009; 42(2): 377-381.
33. Tomita MR. Methods of analysis: From univariate to multivariate statistics. In: Kielhofner G, editor. Research in occupational therapy: Methods of inquiry for enhancing practice. Philidephia: F.A. Davis Company; 2006: 243-280.
34. Lowry R. "Vassarstats: Website for statistical computation". Vassar College. 2001-2016. <www.vassarstats.net> (17 August 2016)
35. Kuckartz U. Maxqda 12. 12.1.4 ed. Berlin, Germany: VERBI Software GmbH; 2016.
36. De Lanerolle I. The future is already here, it's just not very evenly distributed...: Journalism next. Rhodes Journalism Review. 2015; (35): 6-11.

❒

**Corresponding author**
**Paula Barnard-Ashton**
paula.barnard@wits.ac.za


© SA Journal of Occupational Therapy

# Chapter 4. Paper 3

## 4.1. Introduction to paper 3

Paper 3 considers a micro-level (Figure 1.6 p.36), quantitative investigation of the impact that habituation to BL has on student performance. The literature review within this paper considers the role of constructivism in PBL, introduces connectivism and presents an argument for rejecting the "no significant difference" outcome as an indication of the value of the study. This literature was extended in 1.4 (p. 22).

One PBL module of the third-year curriculum was selected as the module was one of the most developed as far as integrating BL was concerned. Two consecutive academic year classes were investigated, the first were new to the use of the VLE and thus considered to be novice student users, while the second class had over a year of exposure. The VLE access data provided evidence of this through the significantly higher rate of access ($p \leq 0.002$) by the second class. The two classes were considered comparable as they had similar performance data for their second-year course.

Student performance data were compared for effect size. Students who were habituated to using BL showed a small effect size improvement in performance, which was meaningful as the average mark shifted from a fail to a pass. The outcome was that more students were able to succeed, having an impact on the throughput rates, which have been a particular concern in the third-year curriculum.

## 4.2. Paper 3: The influence of blended learning on student performance in an undergraduate occupational therapy curriculum

Barnard-Ashton PM, Koch L, and A Rothberg. The influence of blended learning on student performance in an undergraduate occupational therapy curriculum. *South African Journal of Occupational Therapy*. 2014; 44(1):75-80

Status: Published – Copyright is retained by the authors with this journal

# The influence of blended learning on student performance in an undergraduate occupational therapy curriculum

**Paula Barnard Ashton BSc OT (Wits), MSc OT (Wits)**
Lecturer and Manager of elearing project, Department of Occupational Therapy, School of Therapeutic Sciences, University of the Witwatersrand

**Lindsay Koch BSc (OT) UOFS; MSc (OT) Wits**
Lecturer; Department of Occupational Therapy; School of Therapeutic Science; University of the Witwatersrand

**Alan Rothberg, MBBCh (Wits), FC Paed (Wits), PhD (Wits)**
School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand



**ABSTRACT**

*Change is scary, especially when the world of technology, lecturers (digital immigrants) and students (digital natives) come together with learning in mind. Developing blended learning by integrating e-learning into an existing undergraduate Problem Based Learning (PBL) curriculum requires adaptable lecturers and the time for students to become habitual users of the Virtual Learning Environment (VLE). The occupational therapy curriculum at the University of the Witwatersrand has traditionally been delivered via PBL, but the increasing need to improve throughput rates and meet the diversity of learning needs of the students has driven the strategy towards blended learning. This study investigates the effect of habituation (student experience in using e-learning automatically) on student performance in one PBL module.*

*A retrospective two-cohort design was used to review the students' access to the VLE and their performance on the summative assessments of the PBL module of two concurrent academic cohorts. Data were analysed descriptively and statistically for significance (Mann-Whitney U) and effect size (Cohen's d and Hedge's g).*

*There was a significant difference between the two cohort's access to the VLE ($p \leq 0.002$) indicating higher habituation to blended learning in the second cohort, who had more exposure to e-learning due to their second year of using VLE. There was a small but relevant effect size (average d=0.31) in all three measures of student performance when comparing the two cohorts. The average of the student marks on each measure shifted from a failing to a passing average. This study shows that the habituation of blended learning into an existing curriculum results in improved academic performance.*

**Keywords:** curriculum design, blended learning, connectivism, e-learning, developmental assessment

## INTRODUCTION

The context of this study is within an existing Problem Based Learning (PBL) occupational therapy undergraduate curriculum and considers the effect of change management of embedding blended learning within one PBL module by comparing two concurrent cohorts of students in the third year of study. This learning module relates to the skills and knowledge required to assess and treat children with learning challenges. Integrating e-learning into the existing PBL curriculum (creating a blended learning environment) has been a strategic focus within the department over the past four years.

## LITERATURE REVIEW

Problem Based Learning (PBL) is recognised as a successful pedagogical strategy in the training of undergraduate occupational therapy students. It is thought to improve the clinical reasoning[1-3] and problem solving abilities[3,4] of the students and the ability to transfer skills and

© SA Journal of Occupational Therapy

knowledge to new contexts[3,4]. This method of instruction is challenging to students as it requires collaborative group work and independent navigation of the literature, which results in a heavier workload than more traditional forms of instruction[5]. This notion has been challenged by Vardi and Ciccarelli[6], who found that their strategies to focus the students' search for information, and directing them towards prior preparation for PBL sessions, reduced overall workload to within the 10 hours per week allocated to each PBL unit.

Problem Based Learning has been the primary strategy of curriculum delivery for the occupational therapy subjects in this faculty for over a decade. As a mode of curriculum delivery it is soundly based on the constructivist theory of learning design[6-8]. The students engage in building their knowledge through investigating (via accessing the literature) contextually meaningful scenarios that mimic real life[7]. An advantage of PBL is that the learning scenario creates the framework for learning the content and applying the knowledge, while giving the learner some freedom as to how to access the knowledge base[6,7]. The knowledge creation is therefore always current and adapts to changes in the body of knowledge[3]. Enhancing productivity and time management in a curriculum is a common goal in health science education, specifically in the context of PBL which is seen as having a high workload for students[6].

Connectivism is a learning theory that has emerged within the last decade through the work of George Siemens[9]. He responded to the digital era and recognised that historical learning theories (such as cognitivism, behaviourism and constructivism) needed to be reconsidered in the face of the opportunities created by technology and the internet[9]. Connectivism builds on social constructivism by engaging students in collaborative learning activities, but with the view that it is just as valuable to know where to find knowledge as it is to build it[10]. Merrolee Penman in the 2007 Frances Rutherford Lecture[11] identified connectivism as a mechanism of learning and continued professional development for occupational therapists as it creates opportunities for conversations that create learning. She highlighted that Siemens' portrayal of connectivism is that we should not strive to learn more facts, but rather know where to find them and how to apply them appropriately[11]. Problem Based Learning is well suited for the integration of connectivism as networks created by online environments extend the learning opportunities to the worldwide body of knowledge[8]. This includes access to international specialists as human resources, peer reviewed scientific content, patient blogs, international and local peers as well as the PBL group and facilitator[12]. Student's use of technology in PBL is thus an enabler to the learning process[13].

Blended learning is viewed differently in different contexts. In many traditionally face-to-face institutions the definition provided by Zhu, Valcke and Schellens of "combining face-to-face settings with e-learning solutions reflecting social-constructivist conceptions"[14:164] holds true. However, many traditional distance education environments have become flexible in their content delivery and students can select either e-learning or face-to-face learning at a module or degree level, regarding this as blended learning[15]. However, blended learning in the context of this study is the integration of e-learning within a traditional face-to-face or classroom based process, and is thus the instructional design used to implement connectivism within PBL. The use of Virtual Learning Environment (VLE) software creates a common web portal for lecturers, facilitators and students as the mode of delivery of blended learning for a particular course[8]. The VLE is a web-based access-controlled environment that facilitates the distribution of learning materials, administration notifications and assignments[8]. More importantly, it provides a closed space for students to participate in learning exercises, knowledge quizzes, synchronous chat rooms and asynchronous discussion boards, and knowledge collaboration activities such as wikis and blogs[8,16]. Lecturers are required to craft (blend) the combinations of VLE based activities (e-learning) and face-to-face experiences to ensure that learners cover the learning objectives in a manner that is meaningful and applicable to the profession[8,12].

Investigations into the success of blended learning are fraught with the "no significant difference" phenomenon[12,17]. Sims[12] supports Oblinger and Hawkins'[13] position that the need for a significant difference in researching the impact of technology on learning is a myth. They propose that learning is an active process that requires motivation and social engagement, and that technology is an enabler of these learning opportunities[13]. All too often studies attempt to prove that either face-to-face learning or e-learning generates better student performance, alternatively studies attempt to prove that there is no difference[12,13,17]. Oblinger and Hawkins challenge researchers to consider the question of "difference in what?"[13]. They conclude that "the answer depends on how the question is asked"[13:15]. Common confounding limitations to education research is that the population is typically limited to class sizes, and thus studies having a truly randomised control group and experimental group are unlikely to yield sufficient numbers to achieve significance.

Cook[18] asserts that prior studies of the effect of e-learning in health education has done little to inform education practice. In a systematic review of 126 studies, which investigated whether elearning was better than no intervention (or baseline assessment scores) on the factor of knowledge gain, Cook's outcome was that there was a pooled effect size of 1.0, which he considered to indicate approximately 12% change in marks[18]. On the other hand when attempting to compare traditional instruction to e-learning, Cook's analysis of 76 studies yielded much lower effects (averaging an effect of 0.1 for knowledge, skills and satisfaction) and none demonstrated a significant difference[18]. He asserts that this is an unrealistic research question as there is little homogeneity within the observed factors across the existing studies. The review is however limited by the high heterogeneity of the studies, and should be cautiously interpreted. Cook therefore supports the notion that e-learning research should rather focus on when and how e-learning is used most effectively[18]. He dismisses the need to establish transferability or generalisability of study results to the global practice of health education[18]. It is far more valuable to now focus studies on the "when" and "how" to use blended learning effectively within the studies' own educational environment[17,18]. Studies published in line with this focus can then be reviewed for their potential applicability within a particular educational scope, rather than assuming that all e-learning interventions that generate statistically significant difference can then be applied to all learning contexts[18].

Sims[12] and Cook[18] both argue that the heterogeneous nature (in terms of context, participant variables, and content variables) of blended learning and e-learning implementations offer little promise of achieving significant difference in researching these educational strategies. Despite this they both advocate promoting implementation of e-learning specifically because of the heterogeneity in current higher education, as it is a strategy that crosses cultural, time, and space divides[12,18] while allowing opportunity for individuality[12,18] within a social constructivist paradigm[12].

Blended learning takes time to integrate into a pre-existing PBL curriculum. Lecturers and students have varying degrees of computer literacy and confidence in their computer skills. There are early adopters who jump at the opportunity to try new technology and those who have more of a "wait and see" approach. The lecturers of this occupational therapy department committed to this process, attended training on the VLE software and actively engaged with the support provided by the e-learning team. Students have access to the VLE via computer laboratories across campus and in the residences. The department also has a computer in each PBL room as well as two 10 seater computer rooms. This ensured that all students had access to the VLE irrespective of owning personal use computers. This study focuses on the adaptation of the lecturers and students' behaviour from novice uses to habitual users of blended learning within the context of a single PBL module.

## Background to Paediatric Learning Disabilities module

The Paediatric Learning Disabilities module runs in the second semester of the third year of the occupational therapy degree. The focus of the module is on teaching students about the assessment and treatment of children with a variety of learning based difficulties or



© SA Journal of Occupational Therapy

disabilities. Students learn the occupational therapy process applied to this module during 45 scheduled teaching hours over a period of 10 weeks. During the same time period students complete fieldwork in a variety of practice settings that are not related to the module. The students' attention is thus divided between the stressors, demands and learning opportunities associated with fieldwork, and the educational activities associated with the Paediatric Learning Disabilities module.

The module is designed on PBL principles and consists of a variety of activities. Two paper-based client cases combined with client videos are used to stimulate student investigations. A number of workshops and skills laboratories are spread over the 10 weeks to assist students in gaining both theoretical knowledge about assessment and treatment, as well as practical skill in administering, scoring and interpreting standardised assessments (such as the Developmental Test of Visual Perception Second Edition - DTVP-2).

## e-Learning Intervention Strategies (Blended Learning)

In 2009 and the first part of 2010 a number of online activities were developed to complement the already existing PBL process in this module. These activities and resources were loaded onto the course VLE and are detailed below.

1. *Wiki*: A Wiki is an online shared text document, which allows students to simultaneously work, comment and edit on the same document (Wikipedia is possibly the most well-known multi page Wiki as it allows multiple independent authors to simultaneously provide content)19. Wikis were created to allow students to collaborate and share information. Students were able to work on the wikis simultaneously and from any location (home, computer laboratories) and at any time. These documents focussed on theoretical aspects of assessment and treatment.
2. *Pre-clinical formative quiz*: This open-book test was a prerequisite to attend the skills laboratory on paediatric standardised assessments. Students were required to pre-read the assessment manuals and then attempt the quiz as many times as they needed to in order to obtain the required mark of 100%.
3. *Interactive lesson:* This online module took students step-bystep through the administration and scoring of the DTVP-2. It included videos and online scoring activities that students had to complete to progress to the next part of the module. The initial access to the lesson was in groups in their assigned PBL room, requiring face-to-face collaboration between group members during a timetabled workshop. After the workshop the lesson was opened up for access at any time for revision or study purposes.
4. *Optional formative lessons*: Lessons containing test administration videos and scoring practice activities of other paediatric assessments were offered to students as optional self-study and practice opportunities.
5. *Content repository:* Teaching materials (such as videos and documents) were posted for easy continued access.

The rationale for creating these e-learning activities was to assist students' ability to study and revise material anytime and anywhere. These e-learning activities were available to the students of the 2010 and 2011 academic years of the course.

## Aim

The aim of the study was to investigate if an increase in uptake (habituation) of the blended learning approach, infusing e-learning within a PBL occupational therapy curriculum will have an impact on student performance. The following were investigated:

1 The change in student behaviour in terms of online access to the VLE during the single 3rd year PBL module over two concurrent academic student cohorts. Habituation of blended learning behaviour is seen in students who are more experienced and have greater uptake of e-learning.

2 Comparison of effect on student performance in the PBL module between the 2010 (novice cohort) and 2011 (more habituated cohort) third year students over the same two academic years in terms of:

   a. Clinical competence in the skills acquired during the module.
   b. Academic competence in the knowledge gained during the module.
   c. Overall performance of the students.

# METHOD

## Study Design and Sampling Method

A retrospective cohort study design was used. Ethical clearance was obtained as part of a larger study from the University of the Witwatersrand Human Research Ethics Committee (Medical). Students and lecturers gave informed consent at various times during the larger study. Records of student marks and student VLE access footprint were retrieved and reviewed in 2013 in order to fulfil the objectives of the study.

A cohort of all third year occupational therapy student records from 2010 and 2011 were initially reviewed for inclusion in the study. The 2010 cohort consisted of 32 student records and the 2011 cohort consisted of 43 student records. To ensure no prior exposure to the selected PBL module, only those students enrolled in the third year occupational therapy courses for the first time were included. Records of three students in 2010 and two students in 2011 were thus excluded from the study and a total of 70 records were included for analysis: 29 from 2010 and 41 from 2011.

The primary difference between the 2010 and the 2011 cohorts was experience. The VLE was introduced into the curriculum at the beginning of the 2010 academic year, thus students and lecturers were novice users of blended learning. The 2011 cohort had the benefit of prior knowledge of the VLE and the lecturers were more adept at blended learning.

In order to determine whether the two cohorts of student records were comparable, the final second year occupational therapy results of each cohort were compared using the Mann-Whitney U Test. If the two cohorts of students performed at a similar academic level in their second year of occupational therapy (which is a prerequisite and foundation to access the third year course) it could be assumed that differences in marks in the third year module were not due to differences in the academic potential of the two cohorts.

## Measurement tools

Student behaviour was measured through retrieval of the *VLE access footprint (a)* of each student per cohort. Student performance on the module was measured through retrieval of two types of records: *practical competency test marks (b)* and *end-of-module knowledge test marks (c)*. The *overall module performance (d)* of the students was then calculated specifically for this study by combining (b) and (c) into one score.

a) The *VLE access footprint* is a record of each student's activity on the VLE as identified via unique personal login usernames. The footprint record indicates the time and date of access and the navigation of materials and activities on the VLE. Each footprint was analysed to determine the number of instances the VLE was accessed during the 10 weeks of the PBL module. A new access instance was determined by inactivity for more than one hour or accessing the VLE from a new Internet Protocol (IP) address.

b) The *practical competency test marks* reflect performance on a clinical summative assessment of the students' ability to practically administer the mechanics of the paediatric standardised tests, their ability to score the results and interpret those scores correctly according to the psychometric properties of the relevant test. This summative assessment is evaluated in a highly standardised manner that did not change between 2010 and 2011.

c) The *end-of-module knowledge test marks* are the results of a summative paper-based test that is written at the end of the Paediatric Learning Disabilities module. This test assesses



© SA Journal of Occupational Therapy

students' ability to apply the knowledge gained during the module to a paper-based case. This evaluation of student performance is less rigorous in terms of standardisation between the cohorts as test questions change from year to year, and thus the difficulty index of the test has the potential to change. This test is however typical of the end-of-module tests for all modules of the course and has maintained the same overall format.

d) The *overall module performance* for each student was calculated for the purposes of this study. The overall score consisted of the sum of the competency test (pass of 75/100) and the end-of-module test (pass of 50/100) and thus consisted of a score out of 200 with a pass mark of 125. This overall score was calculated to determine overall competence of students in the module as some students might have greater practical skill while others have greater academic skill.

**Table I: Statistical analyses of change between the cohorts**

| | A) VLE Access Footprint Mean (SD) | B) Practical Competency Test (Max of 100) Mean (SD) | C) End-of-Module Test (Max of 100) Mean (SD) | D) Overall Module Performance (Max of 200) Mean (SD) |
|---|---|---|---|---|
| 2010 (n29) | 48.79 (24.49) | 71.78 (15.56) | 49.02 (12.27) | 120.8 (23.91) |
| 2011 (n40) | 69,37 (30.04) | 76.24 (16.12) | 52.87 (12.28) | 129.1 (23.63) |
| Effect size | g=0.73 | d=0.28 | d=0.31 | d=0.35 |
| Mann-Whitney | U = 334 | U = 480.5 | U = 489.5 | U = 482 |
| U | p≤0.002 | p≤0.18 | p≤0.21 | p≤0.18 |

## Data Collection Procedure

Student records (extracted with only student numbers) were accessed retrospectively from the electronic marks system at the university after permission was obtained from the head of department. Records of access to the VLE were drawn from the VLE server database (student numbers are the standard username per student). These records were drawn in 2013 upholding the retrospective nature of the study thus conforming to the ethical principles specified in the ethical clearance. An Excel spreadsheet was used by an independent research assistant, to code each student to ensure anonymity and blinding, and integrate the matching of the records of their second year mark, as well as their data on each of the above measures.

## Data Analysis

All data were tabulated and means and standard deviations calculated for each cohort for each variable. Two forms of analyses were undertaken, analysis to determine the size of differences between the groups and the second to determine the statistical significance or possible influence of chance on the results.

To determine the size of the differences between cohorts (i.e. to determine effect size), the Cohen d and Hedges g effect size calculators were used[20]. The data for each of the student performance measures (b, c, and d) were compared using the Cohen d effect size calculator as the standard deviations for all three of these variables were similar and thus fulfilled the criteria for this test[21]. The standard deviations for VLE access footprint of the two cohorts were dissimilar and thus, because the sample sizes between the two cohorts were also dissimilar, the Hedges g effect size calculator was used to analyse this variable[20]. Cohen's definition of small, medium and large effect sizes was used to determine practical significance of results and a minimum value of d/g = 0.2 was set for effect size[22].

All variables were analysed using the Mann-Whitney Utest[23] to determine the statistical significance of the differences between the two cohorts. The Mann-Whitney U-test was used because the sample size of the two groups was small and data did not fulfil the requirement of normal distribution for parametric statistical tests[24]. The significance level was set at 5% (α=0.05). The statistics were analysed and interpreted by the authors.

# RESULTS

## Comparability of the Cohorts

The Mann-Whitney U Test showed no significant differences between the two cohorts (U=601.5; p=0.94), indicating that both performed at a similar academic level in the second year.

## Analysis of the Behaviour and Performance of the Cohorts

*Table I* summarises the results of the statistical analyses performed on the data sets of both cohorts in this study. The means (m) and Standard Deviations (SD) of each cohort on each measure is indicated, as well as the effect size of the change (habituation) from the 2010 cohort to the 2011 cohort and the statistical significance between each cohort. *Table I* will be further referred to while presenting the results of each variable.

## Student Behaviour Related to Blended Learning

The number of instances of access to the VLE was used to measure the relative uptake of e-learning between the cohorts. The 2010 cohort had an average of 48.8 (SD=24.5) instances, and the 2011 cohort averaged 69.4 (SD=30.0) instances (*Figure 1*).

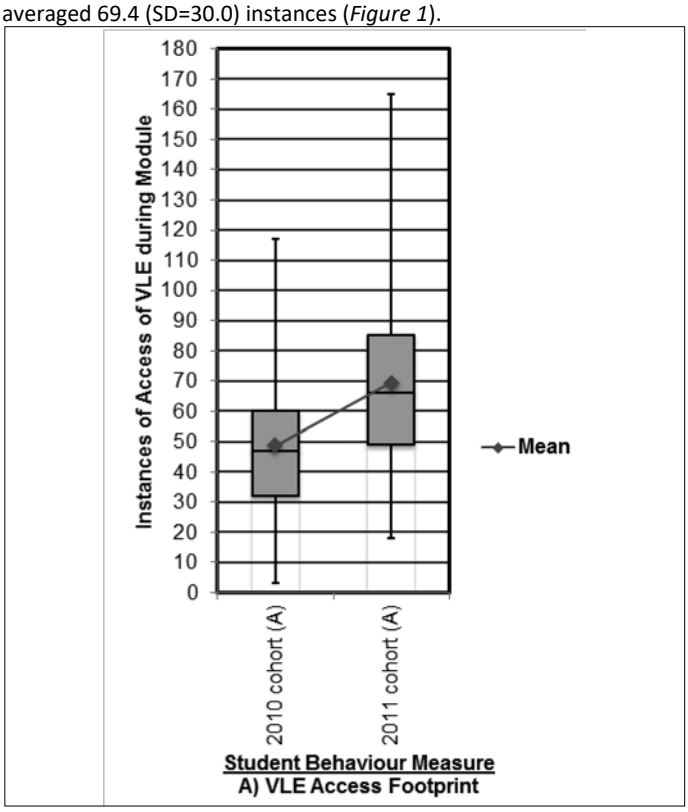



**Figure 1: Box and Whiskers chart comparing the VLE access behaviour of the 2010 and 2011 cohorts**

Statistical analysis (*Table I*) showed that the effect size for the behaviour difference between the two cohorts was g=0.73 (using the Hedges g effect size calculator) and that this difference also had a statistical significance (U = 334; p≤0.002).

## Student Performance

The *practical competency test marks* for the 2010 cohort averaged 71.8% (SD=15.6), with a range from 27.7% to 90.8%. This cohort average was below the 75% pass mark. Of the 29 students in this



© SA Journal of Occupational Therapy

cohort, 13 (45%) failed the initial competency test. The 2011 cohort average was 76.2% (SD=16.1), with a range from 41.7% to 97.7%. This cohort average was above the pass mark of 75%. Of the 41 students in this cohort, 14 (34%) failed the initial competency test (see *Figure 2*).

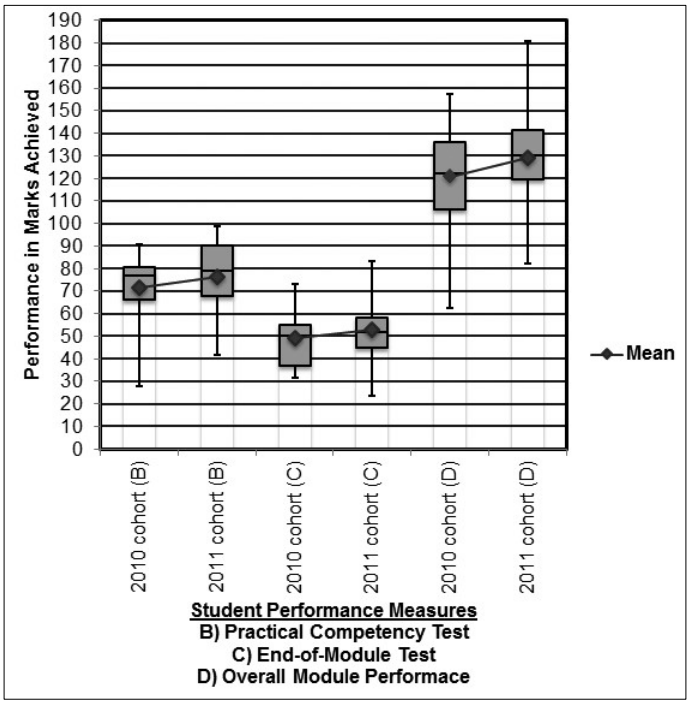



**Figure 2: Box and Whisker chart comparing student performance of the 2010 and 2011 cohorts**

The effect size (*Table I*) of positive change in the *practical competency test marks* from the 2010 to the 2011 cohort was calculated at d=0.28 (using the Cohen d effect size calculator[19]) with a nonoverlap of cohort scores of approximately 21.3%. This effect size, however, did not reach statistical significance on the Mann-Whitney U-test (U=480.5; p≤0.018).

The average *end-of-module knowledge test marks* for the 2010 cohort was 49.0% (SD=12.3), with a range from 33.33% to 73.33% (See *Figure 2*). This average is below the required 50% pass mark. Of the 29 students in the 2010 cohort, 14 (48%) failed this test. The average mark of the 2011 cohort was 52.9% (SD=12.3), with a range from 23.33% to 83.33%. This average was above the required 50% pass mark. Of the 41 students, 16 (39%) students failed this test.

Effect size (*Table I*) for positive change in *end-of-module knowledge test marks* from the 2010 to the 2011 cohort was calculated at d=0.31 (using the Cohen d effect size calculator[19]) with a nonoverlap of cohort scores of approximately 21.3%. Again, however, this effect size did not reach statistical significance when tested on the Mann-Whitney U-test (U=489.5; p≤0.21).

The *overall module performance* average for the 2010 cohort was 120.8 (SD=23.9), with a range from 62.7 to 157.5 (see *Figure 2*). This average is below the 125 "pass" mark. The average for the 2011 cohort was 129.1 (SD=23.6), with a range from 83.25 to 181.1. The average score of the 2011 cohort shifted above the 125 pass mark.

The change in *overall module performance* between the 2010 cohort and the 2011 cohort showed the largest effect size measured in this study with d=0.35 (*Table I*) and a non-overlap of sample scores between 21.3% and 27.4%. This result did not reach statistical significance when tested on the Mann-Whitney U-test (U=482; p≤0.18)

# DISCUSSION

This study set out to investigate whether a change in student behaviour regarding the uptake of blended learning within a PBL module made a difference to their performance in academic and practical student assessments. The 2011 cohort results indicated a significantly greater voluntary uptake of access to the VLE. The results of this study show a promising trend that may have practical significance for educationalists attempting to blend e-learning into a PBL curriculum.

A total of 29 occupational therapy third year students (2010 cohort) entered the PBL module related to Paediatric Learning Disabilities for the first time in 2010, and 41 students (2011 cohort) entered the same module in 2011. There were thus inconsistent sample sizes between the cohorts, which is a typical challenge in educational research[18].

The 2011 cohort had a significantly greater use of VLE over the 2010 cohort, as indicated by an increased average number of instances of access (*Figure 1*). This can be viewed as the students habituating to the blended learning process as they had more experience in the use of the VLE. The 2010 cohort was the first cohort of students to be exposed to the VLE. The lecturers within the department were also novice users and despite training workshops for both the lecturers and students, by the third semester this cohort could still be considered novice users. The 2011 cohort entered the course with prior knowledge of the VLE and the lecturers of all modules were more experienced at the implementation of blended learning. By the third semester these students accessed the VLE habitually. The lecturers were all actively contributing blended learning content and learning activities to all aspects of the occupational therapy curriculum via the VLE during 2011. The statistically significant difference (p≤0.002) and large effect size (g=0.73) support the fact that student behaviour related to blended learning changed from the 2010 cohort to the 2011 cohort (*Table I*). Penman's[11] 2007 call to consider connectivism as an educational theory for occupational therapy curricula seems to have been achieved by this change in student learning behaviour.

## Does the change in student behaviour influence their performance?

The "no significant difference" phenomenon[12,13,18] is not uncommon in studies pertaining to the effect of e-learning on educational outcomes, and thus does not support dismissal of observed improvement in student performance as irrelevant. The small cohort sizes (n1=29, n2=41) within this study further limited the possibility of achieving statistically significant results[24] as the number of students entering this module in any given year is dependent on the university's capacity, student enrolment and academic success rates. The degree of change (effect size) may be considered to be more practically significant to educational practice within the domain of occupational therapy[22,24].

The changes in student performance during the PBL module in the three independent measures did not achieve statistical significance (*Table I*). The small population of third year occupational therapy students at this faculty in 2010 and 2011 however preclude the opportunity for small and medium effect sizes to achieve statistical significance[24].

In all three independent measures, there was positive change (*Figure 2*) from failing average marks for the 2010 cohort to passing average marks for the 2011 cohort, and a smaller percentage of students failed the summative student performance measures for the modules in the 2011 cohort. The failure rate dropped by an average of 9.97% for this PBL module, indicating that almost 10% more students using the VLE habitually (2011 cohort) experienced success. In education, the shift from failing averages to passing averages is of practical importance and should thus not be dismissed.

The effect sizes of these student performance changes (*Table I*) are classified as "small" according to Cohen's guarded classification[22], however they still show positive change with the 2011 cohort's average marks placed at the 62nd percentile rank of the 2010 cohort's averages. The average effect change of d=0.3 is better than the d=0.1 effect observed in the review of 76 randomised control studies of e-learning versus traditional learning[18]. It focusses on the single factor of habituation to blended learning specifically within a PBL occupational therapy curriculum, thus meeting Cook[18] and Sims[12] call for focussed and contextual studies. Even if the effect change is deemed small, the



© SA Journal of Occupational Therapy

consequences for students are relevant and can mean the difference between repeating a year of study or progressing to the next year of study.

### Limitations of the study

This study context is confined to a single course and the cohort numbers are confined to the number of students enrolled at the university, for that course in the particular cohort years. A power analysis was done to determine the sample size required to detect statistical significance[24]. The lower the anticipated effect size the greater the required cohort numbers. A small effect size (d=0.3) would require more than 100 student records in each cohort[24]. The constraints of sample size are a limitation to this study.

## CONCLUSION

Crafting e-learning into an existing PBL curriculum is supported by the premise that connectivism improves motivation and access to individualised learning[7,11]. It is however, a process that takes time to transition the students and lecturers from novice to habitual VLE users. This study shows that when e-learning activities are well crafted into a PBL module, using a variety or resources and VLE tasks, the students who are habitual users of the VLE perform better in the summative assessments, than students who are novice users.

Thus it can be concluded that integrating e-learning into the larger process of PBL assists students in obtaining and retaining the knowledge and skills they require in their progress to becoming occupational therapists. Blended learning can improve student throughput rates. The study further demonstrates that collaborative integration of e-learning in the context of a South African university can be achieved, despite apparent hesitance in terms of infrastructure, computer literacy of students and lecturers, and diversity of the participants.



## REFERENCES


1. McCarron KA, D'Amico F. The impact of problem-based learning on clinical reasoning in occupational therapy education. Occupational Therapy in Health Care, 2002; 16 (1): 1-13.
2. McCannon R, Robertson D, Caldwell J, Juwah C, Elfessi A. Comparison of clinical reasoning skills in occupational therapy students in the USA and Scotland. Occupational Therapy International, 2004; 11 (3): 160-76.
3. Barrows HS. A taxonomy of problem-based learning methods. Medical Education, 1986; 20 (6): 481-6.
4. Liotta-Kleinfeld L, McPhee S. Comparison of final exam test scores of neuroscience students who experienced traditional methodologies versus problem-based learning methodologies. Occupational Therapy in Health Care, 2001; 14 (3/4): 35-53.
5. Peacock D, Walton G, Booth A. The role of LIS in supporting learning. Managing Knowledge in Health Services London: Facet Publishing, 2004: 99-112.
6. Vardi I, Ciccarelli M. Overcoming problems in problem-based learning: a trial of strategies in an undergraduate unit. Innovations in Education & Teaching International, 2008; 45 (4): 345-54.
7. Savery JR, Duffy TM. Problem based learning: An instructional model and its constructivist framework. Educational Technology-Saddle Brook Nj-, 1995; 35: 31.
8. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. Medical Teacher, 2008; 30: 455-73.
9. Siemens G. Connectivism: A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2005; 2 (1): 3-10.
10. Kop R, Hill A. Connectivism: Learning Theory of the Future or Vestige of the Past? International Review of Research in Open and Distance Learning, 2008; 9 (3): 1-13.
11. Penman M. Frances Rutherford Lecture Transforming views of learning: Connecting professional conversations. New Zealand Journal of Occupational Therapy, 2007; 54 (2): 4-15.
12. Sims R. Rethinking (e)learning: a manifesto for connected generations. Distance Education, 2008; 29: 153-64.
13. Oblinger DG, Hawkins BL. The Myth about No Significant Difference. EDUCAUSE Review, 2006; 41 (6): 14-5.
14. Zhu C, Valcke M, Schellens T. Cultural differences in the perception of a social-constructivist e-learning environment. British Journal of Educational Technology, 2009; 40 (1): 164-8.
15. Sethy SS. Distance Education in the Age of Globalization: An Overwhelming Desire towards Blended Learning. Turkish Online Journal of Distance Education (TOJDE), 2008; 9 (3): 29-44.
16. Ward R, Moule P, Lockyer L. Adoption of Web 2.0 Technologies in Education for Health Professionals in the UK: Where Are We and Why? Electronic Journal of e-Learning, 2009; 7 (2): 165-72.
17. Masters K, Ellaway R. e-Learning in medical education Guide 32 Part 2: Technology, management and design. Medical Teacher, 2008; 30: 474-89.
18. Cook DA. The failure of e-learning research to inform educational practice, and what we can do about it. 2009; 31 (2): 158-62.
19. Wikipedia contributors. "Wiki". Wikipedia, The Free Encyclopedia. 2014. <http://en.wikipedia.org/w/index.php?title=Wiki &olsid+593465119> (18 February 2014).
20. Ellis PD. "Effect size calculators". 2009. <http://www.polyu.edu.hk/mm/effectsizefaqs/calculator/calculator.html> (02 May 2013).
21. Ellis PD. The essential guide to effect sizes: Statistical power, meta-analysis, and the interpretation of research results: Cambridge University Press, 2010.
22. Cohen J. A power primer. Psychological Bulletin, 1992; 112 (1): 155-9.
23. Lowry R. "VassarStats: Website for Statistical Computation". Vassar College. 1998-2013. <http://www.vassarstats.net> (11 April 2013).
24. Tomita M. Statistical Analysis. In: Kielhofner G, editor. Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice. Philidephia: F.A. Davis Company; 2006: 213-325.


❐


**Corresponding Author**

**Paula Barnard Ashton**

Paula.Barnard-Ashton@wits.co.za


© SA Journal of Occupational Therapy

# Chapter 5. Paper 4

## 5.1. Introduction to paper 4

Paper 4 was a micro-level study, presented as a poster at the SAAHE 2012 congress in Bloemfontein (Appendix G) and was awarded the runner-up poster prize.

During the fourth-year of study the students attend a public health fieldwork placement in a rural environment. Concerns were raised that students would now have limited access to the VLE and thus experience a form of 'digital apartheid' due to the poor network infrastructure at the rural placements. 'Digital apartheid' imposes barriers to students' access to the digital world, possibly placing them at a disadvantage to peers when a curriculum has a large BL component[60,61]. The concept of 'digital apartheid' is explored in this paper and expanded on in 1.3 p. 14.

The students' perception of their knowledge gain of the learning objectives after the rural fieldwork was compared to their perception of their knowledge gain after their other fieldwork placements. A pre-test post-test control group study was designed issuing TCDs with pre-loaded data to the experimental group to facilitate their access to the VLE. The results indicated that the effect of having the TCDs on the students perceived knowledge gain in the experimental group was significantly larger than that of their peers and of their own experiences of their other fieldwork learning objectives.

From this paper we learnt that 'digital apartheid' may have impact on the students on all fieldwork placements as there was little difference between the control groups perceived knowledge gain while on their rural placement without the TCDs to their other fieldwork and the experimental group's other fieldwork experiences. Even the urban hospitals limit the students' access to their broadband, effectively cutting off their engagement with the VLE when not on the WITS campus. The paper suggests collaboration with all fieldwork placements to facilitate student access to the internet for as needed resource and information retrieval.

## 5.2. Paper 4: Digital apartheid and the effect of mobile technology during rural fieldwork

Barnard-Ashton PM, Adams F, Rothberg A and P McInerney. Digital apartheid and the effect of mobile technology during rural. *South African Journal of Occupational Therapy* 2018 48(2): 20-25

Status: Published - Copyright is retained by the authors with this journal

http://dx.doi.org/10.17159/23103833/2018/vol48n2a4

ISSN On-line 2310-3833

South African Journal of Occupational Therapy Aug, vol. 48 no. 2: 20-25

Creative Commons License 4.0

# Digital apartheid and the effect of mobile technology during rural fieldwork

**Paula Barnard-Ashton BSc OT (Wits), MSc OT (Wits)**
Manager eFundanathi – Learn with Us and Lecturer; School of Therapeutic Sciences; Faculty of Health Sciences; University of the Witwatersrand. Affiliated to the Department of Occupational Therapy

**Fasloen Adams, BSc OT (Stellenbosch), MSc OT (UCT), PhD (Wits)**
Head of Department; Department of Occupational Therapy; School of Therapeutic Sciences; Faculty of Health Sciences; University of the Witwatersrand

**Alan Rothberg, MBBCh (Wits), FCPaed (SA), PhD (Wits)**
Associate Professor; School of Therapeutic Sciences; Faculty of Health Sciences; University of the Witwatersrand

**Patricia McInerney, BSc Nursing (Wits), Dip N Ed (Wits), MSc Nursing (Wits), PhD (Wits)**
Associate Professor; Centre for Health Science Education; Faculty of Health Sciences; University of the Witwatersrand

ABSTRACT

*Fourth year occupational therapy students at the University of the Witwatersrand attend a three-week rural fieldwork placement. During this time, they are in a resource-limited environment with limited access to their usual Virtual Learning Environment (VLE) in a blended learning curriculum, thereby contributing to 'digital apartheid' between students from different socioeconomic backgrounds. This study investigates the effect of mobile technology during rural fieldwork to address 'digital apartheid'.*

*A self-reporting pre-test post-test survey design was used. Students self-evaluated their understanding of fieldwork learning objectives at the start of the year and again midyear. Rural fieldwork marks were collected midy ear. The experimental group ($n_1=13$) accessed the VLE via the mobile technology, whereas the control group ($n_0=7$) did not. Data were analysed for significance and effect size.*

*While there was no significant difference in the student marks ($p=0.27$), there was a significant effect on self-evaluated knowledge gain for the experimental group's rural fieldwork learning objectives ($d=2.02$) which was a notably larger effect size than their other fieldwork learning objectives ($d=1.36$) and that of the control group's learning objectives. The use of mobile technology during rural fieldwork was a successful strategy towards 'digital democracy' by allowing students equal access to access the VLE.*

**Key words:** Digital apartheid, mobile learning, mobile technology, occupational therapy, blended learning, rural clinical fieldwork

## INTRODUCTION

The 21st century has seen the rapid penetration of Information and Communication Technology (ICT) into everyday life, driving changes to the way teaching and learning is conducted in higher education[1,2]. Anywhere-any time access to information has led to democratisation of knowledge[2] and sets the stage for global re-envisioning of higher education[1,2]. These developments have raised the notion of the 'digital divide', initially viewed as a generational chasm between those who have grown up with technology and those who have had to develop digital skills to evolve with it[3,4]. The more recent access related divide was identified as socio-economically between the 'have's' and the 'have-not's'[5]. This polarised view oversimplifies the challenges of integrating technology when considering the South African higher education landscape.

'Digital apartheid', first coined by General Colin Powell[6], refers to the systematic exclusion of certain communities from digital access and experience through political and business policies and practices.[7]

Powell[6] stated: "When I address this issue I use an even stronger term: digital apartheid. What is at stake is today's technology 'have-nots' – especially the young – and whether they may find themselves marginalized for life, because they lack the skills and tools to participate in our globalized, knowledge-based economy. This is true in America and in the rest of the world"[6:2].

The term 'digital apartheid' is multi-dimensional and thus a more comprehensive representation of the realities facing postapartheid South African higher education. Graham[3] introduced a multi-faceted, pluralised perspective to the concept of the 'digital divide' by separating the material dimension and the virtual dimension that contribute towards advantaging some, while segregating others. The South African context adds the third dimension, that of digital skills development[4,8] to further compound student aca-

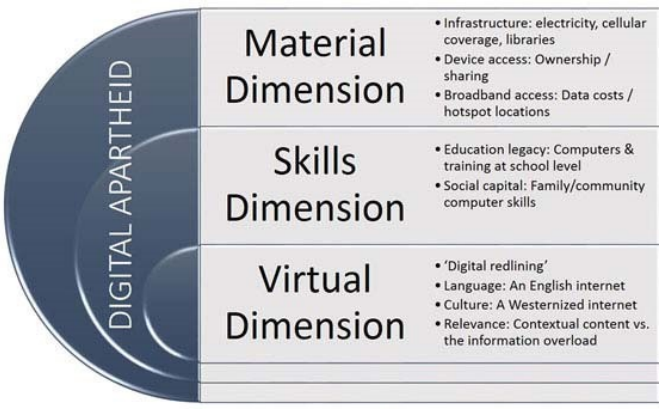



**Figure 1: The dimensions of 'digital apartheid'**



© SA Journal of Occupational Therapy

demic and digital literacy. *Figure 1* (page 20) illustrated the three dimensions of 'digital apartheid' and the factors to consider within each dimension.

The virtual dimension emerges from the intentional act of 'digital redlining' which takes on a number of forms. It may be under the guise of protecting an organisation from spam and illicit, harmful cyber-attacks, but has the secondary outcome of blocking or filtering out communities who only have access through cheaper portals, as these are attractive avenues for hackers and spammers[9]. Another form of 'digital redlining' from South Africa is the rollout of Vumatel's VUMA© high-speed fibre product offered only to neighbourhoods with a large enough portion of the community 'pre-committing' online to using the service[10]. Thus communities who have limited connectivity to begin with are less likely to be able to 'pre-commit'[10]. The VUMA coverage of Johannesburg reveals that despite the existence of a number of affluent suburbs[11], the township areas of SOWETO and Alexandria, as well as the high density inner-city, have been excluded[12]. This corresponds with 'digital redlining' in America as described by Cornish[7]. While the City of Johannesburg is attempting to bridge the inner-city access to Wi-Fi through the provision of 1000 hotspots at bus stations, libraries and clinics, this gives a mere 300 megabytes per day per user[13]. More subtle is the influence of a largely Westernised, English internet[3]. Search engines and social media have algorithms that prioritise frequently accessed content which in turn, influences the visibility of less frequently accessed content that may be of high value to a smaller cultural, language and regional context[3,14].

The skills dimension is most relevant in post-apartheid South Africa where there is still inequity of exposure to technology[15]. It emerged out of a community where ICT lessons were not part of their primary and secondary education until recently. First access to the internet was via a mobile device; social and cultural capital in supporting ICT skills development was just as underexposed, restricting ICT skills and digital citizenship transformation among peers or across generations[4,8,14]. Despite the 2004 White Paper on e-Education recognising the risks of social exclusion in the knowledge economy and mandating the integration of digital literacy into primary, secondary and tertiary education, by 2013[16] political complacency has perpetuated 'apartheid designed education'[17]. Only 19.5% of government primary and secondary schools in South Africa claimed to have internet connectivity for teaching and learning activities by 2015, while 67.8% did not have a computer centre[18]. The lack of these material resources severely hampers the development of digital literacy, highlighting the failure of the Department of Basic Education to achieve the goals of the White Paper on e-Education[16].

The material dimension is the most commonly cited concern when introducing technology into a curriculum. Despite near ubiquitous mobile phone ownership by students[19], the lack of power infrastructure in lower socio-economic areas[8] and exorbitant data costs[20], impact some students' ability to access their learning resources. In South Africa where mobile data costs are very high when compared to other African countries. In 2014 South Africa was ranked tenth in African countries for the cost of one Gigabyte (GB) of mobile data (almost four times the Tunisian price – the cheapest at the time)[20], but slipped to 16th in 2016 to almost six times that of Tanzania (current cheapest country)[21]. Of further concern is the patchy South African mobile broadband coverage and distribution of Wi-Fi enabled access[20]. These factors have the greatest impact on students from low socio-economic backgrounds, as internet access is dependent on available funds for data or physical access to a location with Wi-Fi[4]. Access to the internet via hotspots and internet cafés is largely an urban affordance and thus requires travel as an added expense for students selecting this avenue of access[14]. It is thus important when considering 'digital apartheid' to engage with all three dimensions.

Brown and Czerniewicz[4] suggested mobile technology as a plausible strategy towards the opposite of digital apartheid viz. 'digital democracy'. They highlighted that curriculum re-design would be necessary to facilitate Mobile Learning (mLearning). mLearning provides opportunities for students to access their Virtual Learning Environment (VLE) and other mobile-friendly online learning resources as and when needed, for 'just-in-time learning'[20,22,23]. By 2011, 84.2% of South Africans over the age of 15 years owned a mobile phone, 51% of which were devices capable of accessing the internet[19]. With the falling costs of mobile devices, many South African students and lecturers now have access to such devices[22].

In health professions education, mLearning provides a wealth of learning opportunities[23]. Pimmer *et al.*[24] explored the mLearning experiences of postgraduate midwifery students working in rural clinics and hospital settings. Their study indicated that mLearning was facilitated through communication with peers and facilitators (via social networking groups, text, chat groups and voice calls) and online searches for relevant information. The study outcomes highlighted students' abilities to solve clinical problems as they happened, reflect on their practice over time, access emotional support, and be exposed to unique learning opportunities through their community of practice. Students reported experiencing a sense of belonging while being somewhat isolated in remote rural settings by participating in mLearning group activities[24]. Mtebe and Raisamo[22] investigated factors influencing the adoption of mLearning in higher education in East Africa. The students reported an expectation of improved academic performance through mLearning which would drive the adoption of mLearning as a learning strategy[22].

The rapid developments in Tablet Computing Device (TCD) technology since 2010 (with larger screen and keyboard, while retaining mobility), create an advantage for TCDs over a typical smart mobile device for mLearning[25]. Byrne-Davis *et al.*[23] had similar considerations in their study of fourth year medical students in geographically dispersed settings, who wanted access to course resources and instant communication channels. Their study aligned to this study in the implementation of Problem Based Learning (PBL) across their curriculum and their view that the issuing of TCDs was an appropriate enabler of mLearning. Results indicated that students had initial concerns around their accountability for the safety of the TCDs in terms of theft or damage, but over a 12 month period felt the TCDs benefited their learning and ability to communicate with colleagues[23].

Blended learning has been integrated into the undergraduate occupational therapy curriculum at the University of the Witwatersrand since 2010. In striving towards post-apartheid transformation, the admissions policy for the degree selects 40% of students on the basis of exceptional academic performance, and 60% based on transformation criteria: ethnicity (20%), rural origins (20%), or education in poorly-resourced schools (20%)[26]. 'Digital apartheid' presented a significant threat to the success of blended learning and is addressed during the four years through on-campus access to resources, infrastructure, ICT skills development and digital literacy support, such that by the final year the students have largely reached a level of 'digital democracy'. Students are required to attend at least 1000 hours of mandated clinical fieldwork during the programme[27] and during the final year, the students attend clinical fieldwork rotations for the majority of the year in various practice domains. Three weeks are at a rural site focusing on community-based rehabilitation and district health services in low socio-economic regions. For blended learning to be accessible across the occupational therapy undergraduate training platform, the students attending the rural fieldwork rotations needed access to the VLE and online resources. During this time however, the students have limited internet access as these placements have unreliable network infrastructure and restrict student access to the few on-site computers. This presents a sudden return to 'digital apartheid' as those students from higher socio-economic backgrounds own their own laptop computers and can afford high data costs while away from home, while those dependent on the on-campus resources are marginalised or have sporadic access via their personal mobile device as and when they can afford pre-paid data.


© SA Journal of Occupational Therapy

## METHOD

The aim of the study was to investigate the effect of students having access to TCDs with University funded pre-paid data during the rural fieldwork placement to achieve digital democracy. Two constructs were investigated: the students' perceived knowledge gain and academic performance.

A quantitative self-reporting pre-test post-test survey design was implemented over the first six months of the academic year to evaluate students' perceived knowledge gain across all fieldwork related learning objectives. A quantitative analysis of academic performance considered the possible impact of digital democracy on student marks.

### Setting

The final year occupational therapy students typically attend the three-week rural fieldwork rotation in pairs or groups of three per placement, and are accommodated at a rural hospital >300km from the university. The purpose of the rotation is for students to explore the role of occupational therapy in the field of public health in a typical rural, low socio-economic and impoverished setting; to develop knowledge of the district health system; and to acquire the clinical skills and attitudes necessary to practice appropriate occupational therapy related community rehabilitation. The students participate in community projects such as: an ongoing community project for people with disabilities; nursery school clinical and developmental screening with students from other disciplines; home visits to people with disabilities; community health education drives; and occupational therapy services at community clinics. The students are required to hand over documents (in the form of a paper-based carry-over file) between groups to facilitate continuity of the activities from group to group. Students rotate sequentially in three- to four-week blocks through the rural fieldwork and four other non-rural experiential placements, and are thus not all on the rural placements simultaneously.

The students' performance is assessed in four activities: an individual presentation; group presentation; written work in the carry-over file; and a clinical mark. The clinical mark is awarded by the rural placement clinical educator, counting 15% of the total mark while the remaining activities are marked by the university supervisor who lives in close proximity to many of the rural sites and seldom comes to the University.

### Intervention

All students had prior experience in the use of the course VLE for learning activities and communication. Documents, guidelines and links to websites pertinent to rural public health were available on the VLE. A wiki page was created for each hospital for the students to add information about the hospital, thus informing the follow-on groups of the facilities, and generally what to expect. All groups had access to the same VLE content.

The experimental group was issued one TCD per pair, or two between three students at a placement. A pre-paid 500MB mobile data bundle was loaded onto the TCD mobile network Subscriber Identification Module (SIM) cards to ensure that the students were not carrying the data expense. This facilitated the students' ability to access the VLE and other resources anytime and anywhere during the fieldwork in an attempt to create digital democracy. The control group had on-campus access to the VLE before leaving and after returning from the rotation as they were not issued TCDs, but were not restricted in using personal devices during the fieldwork. So as not to disadvantage the control group, they were issued with TCDs during their urban community fieldwork under the same conditions as the experimental group had for their rural fieldwork. The urban and rural fieldwork marks accumulate to the public health curriculum with equal weighting.

### Data collection

The survey instrument for this study made use of a 5-point scale based on the method used by McCannon *et al.*[28] in order to evaluate students' self-evaluated knowledge-gain during their fieldwork.

The scale ranged from '1=no knowledge and understanding' to '5=complete knowledge and understanding'. It consisted of a list of 47 learning objectives that pertained to the students' fieldwork requirements during the first six months of the academic year as listed in their curriculum guideline. These learning objectives were randomly ordered via a number draw. Fifteen of the survey items pertained to the Rural Fieldwork Learning Objectives (RFLO), while the remaining 32 were from Other Fieldwork Learning Objectives (OFLO) related to adult psychiatry, paediatrics and adult physical rehabilitation fieldwork. Students were instructed to rate their confidence in their knowledge if they were to write an exam or be examined on that skill at that time.

The baseline survey was paper-based and distributed at the start of the academic year during the fieldwork orientation session. The post-test survey was done mid-year during a one-week campus-based teaching rotation, by which time the students had at various times participated in the same spread of fieldwork rotations. The students were blinded to the study outcome of the RFLO as the target of the experiment, and that the use of the TCDs on the rural fieldwork rotation was being investigated. The pre-test, post-test data were compared, and the difference indicated the students self-evaluated knowledge gain. Data were analysed for significance and effect for the RFLO's for students with or without the TCDs as well as pre-test, post-test data of the OFLO's where students were not limited in their access to the VLE.

Academic performance, in the form of the final student marks for the rural fieldwork rotation was captured at the time of the survey post-test. The clinical educators were not aware of the study thus controlling for marking biases when allocating the clinical marks. While the off-campus university supervisor was aware of the study she was not specifically involved with the study details and was not aware that academic marks were being investigated as a measure. While she was therefore not specifically blinded to which students were in each group, she was also not sensitised to the research outcome related to academic performance. The study was designed by the University- based clinical co-ordinator and the first author.

### Participant selection

All final year occupational therapy students were invited to participate in the surveys, convenience sampling was thus employed. Students were under no obligation to participate and they were made aware that they were free to withdraw at any stage without consequence. They were further advised that there would be a mid-year repeat of the survey. Participant allocation to the control or experimental group was directed through two situational variables: a) departmental allocation of students into fieldwork groups; b) timing of the rural fieldwork rotation of each group in relation to availability of the TCDs.

**Control group ($n_0$)**: Students on the first two rural fieldwork rotations were not provided with TCDs for their rural fieldwork as these were not yet available in South Africa. They did however have the TCDs for their urban community fieldwork which is also a module of the public health course.

**Experimental group ($n_1$)**: Students on the third and fourth rural fieldwork rotation were issued TCDs (irrespective of whether they had personal devices) in order to facilitate access to the VLE and other online resources.

The Human Research Ethics Committee (Medical) of the University provided ethical clearance for this study (M090920 and M160877). All students had access to a TCD for one of the fieldwork placements (either rural or urban) that form part of the fourth year Science of Occupation course. They were issued during the second quarter of the year to all students on rural or urban fieldwork and as such, were all introduced to the TCDs to support the public health curriculum during the same phase of the year.

### Data analysis

The self-evaluated knowledge gain survey data and academic performance data for all consenting participants were paired. Baseline and post-test (at six months) data for the control and


© SA Journal of Occupational Therapy

experimental groups were captured by a research assistant on a Microsoft Excel 10 spreadsheet using the participant numbers.

The data were analysed for significance ($\alpha=0.05$) using the Mann-Whitney test for non-parametric data on Vassarstats.com[29]. The self-evaluated knowledge gain data are directional as students are expected to gain knowledge over the three-week fieldwork, and academic performance between groups is non-directional as either group could perform better.

The self-evaluated knowledge gain data were analysed for effect using Cohen *d*, and the academic performance data were analysed using Hedges g on the Coe[30] Effect Size Calculator in Microsoft Excel 10. The Cohen *d* analysis is appropriate when using repeated measures and Hedges g reduces the bias in unequal small samples. According to Hill *et al.*[31] a key benchmark in interpreting effect size is knowing the expectation of change in non-intervention conditions (the effect that typical fieldwork experience has on self-evaluated knowledge gain). This benchmark provides a comparative range from which to observe the effect of the change in an intervention group (the effect of the TCDs facilitating access to the VLE on self-evaluated knowledge gain). This study was designed to establish benchmark range of effect sizes through control group data as well as the experimental group providing its own non-intervention effect size of the self-evaluated knowledge gain in the OFLO. The intervention data represented the experimental group's RFLO self-evaluated knowledge gain.

## RESULTS

The final year occupational therapy class consisted of 26 students of which six (23%) either declined participation or withdrew during the study (failed to complete the post-test survey). Of the participating students (N=20), 13 were in the experimental group (65%) and seven were in the control group (35%).

Self-evaluated knowledge gain was indicated by the difference in the pre-test to post-test 5-point scale scores for each learning objective. *Table 1* (below) indicates the self-evaluated knowledge gain for both groups and the average academic performance of the students during the rural fieldwork. The experimental group indicated a 0.91 mean difference on the 5-point scale for the RFLO's, compared to a 0.42 gain in their OFLO's. While academic performance was not significantly different between the groups, a medium effect size (Hedges g=0.50) was noted in the experimental group performing higher than the control group.

The within-group self-evaluated knowledge gain as anaysed for effect (Cohen d) with associated confidence intervals (95% CI) is represented in *Figure 2*. The intervention data effect size for the experimental group RFLO (d=2.02, CI=1.02–2.89) is significant and exceeds the expected effect indicated by the other three benchmark data groups (range: d=1.10 to d=1.36).

As the groups attended the rural fieldwork at different times between the baseline and the post-test, the time variable was investigated. The mean self-evaluated knowledge gain within the fieldwork groups were consistent with their overall control or experimental group data.

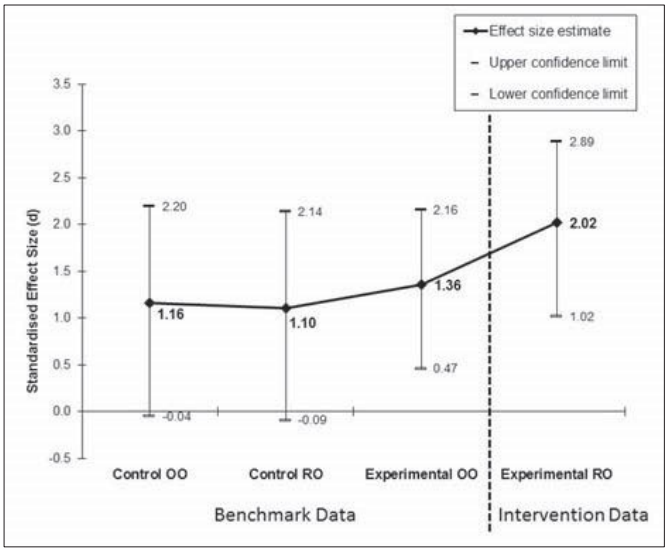



**Figure 2: Standardised effect and confidence intervals of self-evaluated knowledge gain during rural and other fieldwork ($n_0=7$; $n_1=13$)**

*Figure 2* (above) illustrates that while the control group's self-evaluated knowledge gain effect size is not significant (CI=95% goes through 0), their OFLO had a large[31] estimated effect size (d=1.16, CI=-0.04–2.20), similar to that of the significant estimated effect size of the experimental group's OFLO (d=1.36, CI=0.47–2.16), forming a baseline of expected effect size. The control groups RFLO had a similar effect size (d=1.10, CI=-0.09–2.14) to their OFLO, whereas the experimental group's RFLO had a significant and much larger effect size (d=2.02, CI=1.02–2.89).

When comparing the self-evaluated knowledge gain between groups, there was a medium-large effect size (Hedges g=0.68, CI=0.26–1.63) for the RFLO with almost no effect (Hedges g=0.08, CI=-0.84–1.00) for the OFLO.

**Table 1: Average self-evaluated knowledge gain and academic performance**

| | | Control Group $n_0=7$ | Experimental Group $n_1=13$ |
|---|---|---|---|
| Rural Fieldwork Learning Objectives (RFLO) | Within group self-evaluated knowledge gain (m, SD) | 0.51, 0.47 | 0.91, 0.60 |
| | Significant difference between pre-test and post-test (p) | 0.0274* | 0.0001* |
| | Between group self-evaluated knowledge gain (mean difference) | 0.40 | |
| | Significant difference between groups (p) | 0.2187 | |
| | Effect size (Hedges g, CI) | 0.68, -0.26–1.63 | |
| Other Fieldwork Learning Objectives (OFLO) | Self-evaluated knowledge gain (m, SD) | 0.39, 0.27 | 0.42, 0.42 |
| | Significant difference between pre-test and post-test (p) | 0.0793 | 0.0018* |
| | Between group self-evaluated knowledge gain (mean difference) | 0.03 | |
| | Significant difference between groups (p) | 0.9045 | |
| | Effect size (Hedges g, CI) | 0.08, -0.84–1.00 | |
| Academic Performance in Rural Fieldwork | Fieldwork mark as percentage (m, SD) | 64.1, 2.6 | 66.2, 4.7 |
| | Significance (p) | 0.2661 | |
| | Effect size (Hedges g, CI) | 0.50, -0.44 – 1.43 | |


© SA Journal of Occupational Therapy

## DISCUSSION

The students' self-evaluated knowledge gain was determined through self-reported rating of their knowledge of the learning objectives at the start of the academic year and again at the midyear contact session. It is anticipated that students would perceive themselves to have gained knowledge through their fieldwork experiences. While a significant difference was not noted for the control group OFLO ($p=0.0793$) there was a mean self-evaluated knowledge gain of 0.39 on the 5-point scale. A significant difference in self-evaluated knowledge gain was noted in the control group's RFLO and both sets of the experimental group's learning objectives (*Table 1*).

In this study the OFLO data of both groups represented the assumed 'digital democracy' conditions of their local academic activities (*Table 1*), which formed the benchmark of expected change (effect size)[31]. The control group's RFLO data was expected to represent possible 'digital apartheid' conditions of segregating students' access based on personal resources (material barrier/ affordability) while away from campus[3] on their rural fieldwork placements. The estimated effect size (though not significant) was however almost the same ($d=1.10$, CI=-0.09–2.14) as for the control group's OFLO, and similar to the experimental group's OFLO's. This raises the question of whether we have truly achieved 'digital democracy' by the final year in the context of fieldwork placements that are near campus, where students stay at home or in campus residences. The fieldwork is full-day placement at an off-campus hospital or school, possibly indicating that the campus resources are not readily accessible to student irrespective of whether the placement is local or rural. Anytime-anywhere access does not apply in the same way as during their previous academic years, during which much of the academic day is on campus, and 'digital democracy' is more likely due to more equitable and effective campus-based resources.

It is thus reasonable to determine the non-intervention expected change/effect size benchmark to be within the range $d=1:10$ to $d=1.36$, as the trend of change was similar across the self-evaluated knowledge gain when comparing the control and experimental groups for the other fieldwork settings, and the control group's RFLO. The intervention data of the experimental group RFLO represented the strategy towards 'digital democracy' by providing TCDs with pre-paid data to facilitate VLE and online resource access equitably to all students (material support). The results illustrated in *Table 1* indicated a significantly large effect ($d=2.02$, CI=1.02–2.89), which exceeded the benchmark expected change by 0.66, indicating that the use of TCDs during the rural fieldwork had a positive effect on the students self-evaluated knowledge gain and towards 'digital democracy'. The TCDs facilitated the opportunity for students in the experimental group to use various online tools during the rural fieldwork; such as access the navigation application, online resources such as the Department of Health policies and clinical information sites; and full access to their past and current VLE content (not only the Rural Fieldwork content). This opportunity possibly allowed the students in the experimental group to feel more connected to resources any-time and any-where throughout the day. Students' abilities to access and use information relevant to the fieldwork learning objectives possibly allowed them to feel more confident in their knowledge than the control group, and more confident than when they themselves were on other fieldwork without the TCDs. This was further supported by the medium estimated effect size (Hedges $g=0.68$, CI=-0.26–1.61) when comparing the RFLO between the control and experimental groups. Creswell[32] suggested that an effect size ≥0.5 as the standard indication of effect between two groups, which was achieved in this study despite the wide confidence interval (CI=95% goes through 0).

The academic performance during the rural fieldwork was not significantly different between the control and experimental groups but a medium estimated effect size (Hedges $g=0.50$, CI=-0.44–1.43) meets the standard indicated by Creswell[32] as a reasonable effect when comparing the groups, suggesting a possible positive impact of the students using TCDs on the rural fieldwork on their academic performance.

This study is limited in having a small sample size due to the number of final year occupational therapy students, resulting in a low statistical power to detect a significant effect of the intervention hence the confidence intervals for the control group extended below zero. The possibility of bias in the academic marks provided by the off-campus university supervisor are acknowledged. The study is also limited in not being able to track personal device usage to access the VLE and other online resources by students.

## CONCLUSION

'Digital apartheid' presents a threat to the successful implementation of blended learning, where during fieldwork some students have better access to online resources than others, particularly during the final year occupational therapy rural fieldwork rotation. This study focused on self-evaluated knowledge gain and academic performance among students using TCDs to access their VLE during rural fieldwork and use of TCDs as a strategy towards achieving 'digital democracy'. Non-intervention benchmark data were established using the control group's self-evaluated knowledge gain in OFLO and RFLO, and the experimental group's self-evaluated knowledge gain for OFLO. Intervention data were collected for the self-evaluated knowledge gain in RFLO of the experimental group. Academic performance data were collected for both groups.

Caution is required in concluding that 'digital democracy' was achieved by the final year as the first three years are largely campus-based, and the final year is largely clinical and off campus. It appears that the effect size on perceived knowledge gain was similar whether the students were at local placements (OFLO) or the control group's rural placements without the material support of the TCDs with pre-paid data. The experimental group's access to the VLE and online resources via the TCDs during the rural fieldwork indicated an effect size that exceeded the range indicated by the benchmark data. The results suggest that facilitating anytime-anywhere access throughout the fieldwork day may impact the premise of 'digital apartheid' and have a positive effect on self-evaluated knowledge gain and academic performance.

As an outcome of this study the final year occupational therapy students are issued a TCD per pair while on their rural fieldwork, and the content and tasks available on their VLE have been tailored to further support their learning experiences. Further investigation of the status of 'digital apartheid' across all fieldwork placements is indicated and consideration should be given to strategies such as the provision of TCDs across all fieldwork placements. Such an endeavour would warrant a Costs Benefits Analysis to determine if the expense of data and TCD procurement would be justified. We are striving to build relationships with local hospitals to allow student access to hospital bandwidth and Wi-Fi, which would significantly reduce the costs.

This study suggests that the democratisation of digital access for all occupational therapy students on fieldwork placements will have a positive effect on equalising their opportunities for attaining successful academic outcomes and a positive impact on their perception of their performance on their fieldwork learning objectives. Mobile technologies present an enabling tool when provided with a curriculum that supports and integrates mLearning effectively.

## REFERENCES


1. Irvine V, Code J, Richards L. Realigning higher education for the 21st-century learner through multi-access learning. Journal of Online Learning & Teaching. 2013; 9(2): 172-86.
2. Council on Higher Education (CHE). South african higher education reviewed: Two decades of democracy. Pretoria: Council on Higher Education; 2016.
3. Graham M. Time machines and virtual portals. Progress in Development Studies. 2011; 11(3): 211-27.




© SA Journal of Occupational Therapy

4. Brown C, Czerniewicz L. Debunking the "digital native": Beyond digital apartheid, towards digital democracy. Journal of Computer Assisted Learning. 2010; 26(5): 357-69.
5. Brown A, Vosper H. Development of a blended learning environment to support achievement of graduate outcomes through optimal learning in an undergraduate pharmacy course. Pharmacy. 2013; 1(2): 204-17.
6. Powell CL. Is the digital divide a problem or an opportunity? Businessweek. 2000 (18); December: 20.
7. Cornish S. "Is digital redlining causing internet caste system?". The Afro-American Newspapers. 2015. <http://www.afro.com/ is-digital-redlining-causing-internet-caste-system/> (1 April 2018)
8. Czerniewicz L, Brown C. The habitus of digital 'strangers' in higher education. British Journal of Educational Technology. 2013; 44(1): 44-53.
9. Dornan P, Hudson J. Welfare governance in the surveillance society: A positive-realistic cybercriticalist view. Social Policy & Administration. 2003; 37(5): 468-82.
10. Vumatel. "Vuma faq: How does vuma decide which suburbs to roll out into first?". 2018. <https://vumatel.zendesk.com/hc/en-us/articles/207785909-How-does-VUMA-decide-which-suburbs-toroll-out-into-first-> (30 March 2018).
11. ShowMe. "Showme soweto". ShowMe™ Community Websites. 2018. <https://showme.co.za/soweto/about-soweto/> (10 Feb 2018).
12. Vumatel. "Vumatel coverage map: Johanneburg". 2018. <https://vumatel.co.za/coverage> (30 March 2018).
13. Jozi Digital Ambasassadors. "How to connect to joburg's free wifi". 2016. <http://digitalambassadors.org.za/how-to-connectto-joburgs-free-wifi/> (3 March 2018).
14. Pritchard GW, Vines J, editors. Digital apartheid: An ethnographic account of racialised hci in cape town hip-hop. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems; 2013: ACM.
15. Kajee L, Balfour R. Students' access to digital literacy at a south african university: Privilege and marginalisation. Southern African Linguistics and Applied Language Studies. 2011; 29(2): 187-96.
16. Department of Education. White paper on e-education: Transforming learning and teaching through information and communication technologies (icts). Government Gazette: Republic of South Africa. 2004; 470(26734): 1-43.
17. Naidoo S, Raju J. Impact of the digital divide on information literacy training in a higher education context. South African Journal of Libraries and Information Science. 2012; 78(1): 34.
18. Department of Basic Education. Neims: National education infrastructure management system standard report. Pretoria: Department of Basic Education; 2015.
19. Calandro E, Stork C, Gillwald A. Research ict africa policy brief no. 2: Internet going mobile - internet access and usage in 11 african countries. Cape Town; 2012.
20. De Lanerolle I. The future is already here, it's just not very evenly distributed...: Journalism next. Rhodes Journalism Review. 2015; (35): 6-11.
21. Chair C. "Update: State of prepaid market in south africa submission to the parliament of south africa on "the cost to communicate in south africa"". Research ICT Africa. 2016. <http://researchictafrica.net/publications/Other_publications/2016_South%20 Africa_Cost%20to%20Communicate%20Submission_RIA%20. pdf> (28 September 2016)
22. Mtebe JS, Raisamo R. Investigating students' behavioural intention to adopt and use mobile learning in higher education in east africa. International Journal of Education and Development using Information and Communication Technology. 2014; 10(3): 4-20.
23. Byrne-Davis L, Dexter H, Hart J, Cappelli T, Byrne G, Sampson I, et al. Just-in-time research: A call to arms for research into mobile technologies in higher education. Research in Learning Technology. 2015; 23: 1-10.
24. Pimmer C, Brysiewicz P, Linxen S, Walters F, Chipps J, Gröhbiel U. Informal mobile learning in nurse education and practice in remote areas—a case study from rural south africa. Nurse Education Today. 2014; 34(11): 1398-404.
25. Gioannis P. E-medlab: A distance learning medical laboratory via a tablet pc. Applied Medical Informatics. 2012; 31(3): 64-8.
26. University of the Witwatersrand. "Wits university revises its mbbch degree admissions policy". 2016. <https://www.wits.ac.za/media/wits-university/faculties-and-schools/health-sciences/studentdocuments/undergraduate/Wits%20University%20Revised%20 Health%20Sciences%20Admissions%20Policy.pdf> (November 08 2017).
27. de Witt PA. Ethics and clinical education. South African Journal of Occupational Therapy. 2016; 46(3): 4-9.
28. McCannon R, Robertson D, Caldwell J, Juwah C, Elfessi A. Students' perceptions of their acquired knowledge during a problem based learning case study. Occupational Therapy in Health Care. 2004; 18(4): 13-28.
29. Lowry R. "Vassarstats: Website for statistical computation". Vassar College. 2001-2016. <www.vassarstats.net> (17 August 2016)
30. Coe R. "Effect size calculator". CEM Centre for Evaluation & Monitoring. 2016. <http://www.cem.org/effect-size-calculator> (04 October 2016).
31. Hill CJ, Bloom HS, Black AR, Lipsey MW. Empirical benchmarks for interpreting effect sizes in research. Child Development Perspectives. 2008; 2(3): 172-7.
32. Creswell JW. Action research designs. Educational research: Planning, conducting, and evaluating qualitative and quantitative research. 4th ed. Boston: Pearson; 2012: 576-601.

❒

**Corresponding Author**
Paula Barnard-Ashton
paula.barnard@wits.ac.za


© SA Journal of Occupational Therapy

# Chapter 6. Paper 5

## 6.1. Introduction to paper 5

Paper 5 presents a macro-level (Figure 1.6 p. 36) reflection on the 6 years of PAR towards integrating BL into the undergraduate occupational therapy curriculum. It considers four perspectives (or lenses): that of the researcher as a learner in the process, that of the lecturers who were peer participants, that of the students and that of the literature. This is a qualitative critical reflection of the PAR using Stauss's grounded theory method of data analysis[188]. The paper describes the interventions over the six-years and offers a rationale for using Brookfield's lenses of critical reflective practice[179,189].

Two core categories emerged from the data analysis: Drivers of change and the outcomes of BL. The 'drivers of change' describe the change agent elements that impacted the successes and failures of aspects of the research and what we learnt from these. The 'outcomes of BL' gives a qualitative reflection of the experiences of the researcher, the lecturer stakeholders and the student stakeholders.

The long-term integration of BL into the undergraduate occupational therapy curriculum has been viewed as both essential to the curriculum and beneficial to all stakeholders. There is an overwhelming sense of this is how teaching and learning happens in the DOT.

## 6.2. Paper 5: The integration of blended learning into an occupational therapy curriculum: A qualitative reflection

Barnard-Ashton PM, Rothberg A and P McInerney. The integration of blended learning into an occupational therapy curriculum: A qualitative reflection. *BMC Medical Education*. 2017; 17(135):1-13

Status: Published – Copyright is retained by the authors for this journal as confirmed by the letter from the Senior Editor (Appendix H)

Barnard-Ashton et al. BMC Medical Education (2017) 17:135
DOI 10.1186/s12909-017-0977-1

BMC Medical Education

RESEARCH ARTICLE Open Access

# The integration of blended learning into an occupational therapy curriculum: a qualitative reflection

Paula Barnard-Ashton[1], Alan Rothberg[2] and Patricia McInerney[3]

Abstract

Background: This paper presents a critical reflection of the integration of Blended Learning (BL) into an undergraduate occupational therapy curriculum which was delivered through Problem Based Learning (PBL).

Method: This is a qualitative reflection of a Participatory Action Research (PAR) study using Brookfield's model for critical reflection of an educator's practice. The model uses four 'lenses' through which to focus enquiry: Lens 1) our autobiography as a learner of practice; Lens 2) our learners' eyes; Lens 3) our colleagues' experiences; and Lens 4) the theoretical literature. Grounded theory analysis was applied to the data.

Results: The factors that contributed to successful integration of technology and e-Learning into an existing curriculum, the hurdles that were navigated along the way, and how these influenced decisions and innovation are explored. The core categories identified in the data were "drivers of change" and "outcomes of BL integration". Key situations and pivotal events are highlighted for their role in the process that led to the project maturing. Each lens reflects the successes and hurdles experienced during the study.

Conclusion: Brookfield's model provides an objective method of reflection which showed that despite the hurdles, e-Learning was successfully integrated into the curriculum.

Keywords: Blended learning, Curriculum development, E-learning, Occupational therapy, Reflective practice

## Background

Health science educators in South Africa have been under increasing pressure to produce greater numbers and higher quality health care practitioners within the massification trend [1]. Statistics show that fewer than 50% of students progress through their degree courses in the minimum number of years. The majority require an additional year or two, drop out or are excluded before completion [2]. As class sizes increase, a greater burden is placed on the higher education system [1]. Clinical fieldwork placements must also accommodate more students [3]. Meanwhile, lecturer numbers have not increased, resulting in higher workloads to support the undergraduate curriculum. Some curricula are very demanding in terms of student: lecturer ratios. The consequence of lecturers having to focus on undergraduate teaching and supervision is the erosion of time for high quality research.

This study focuses on an occupational therapy curriculum, which is a 4 year Bachelor of Science degree delivered primarily through Problem Based Learning (PBL) [4, 5]. The average PBL session involves a lecturer: student ratio of approximately 1:9. Producing skilled practitioners requires clinical skills training and individual supervision at dispersed clinical fieldwork sites. Faculty thus have to travel to various clinical fieldwork sites to support this intensive training process [3, 4]. Over the last decade the full time staff establishment has remained static at eleven qualified academics.

In 2008, the Department of Occupational Therapy (DOT) held a strategic planning meeting at which the teaching and learning strategy was reviewed. Brainstorming on how to cope with the rising student numbers and alignment with the institution's plans led to the agreement

* Correspondence: paula.barnard@wits.ac.za
1 School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand. Affiliated to the Department of Occupational Therapy, 7 York Road, Parktown, Johannesburg 2193, South Africa
Full list of author information is available at the end of the article

© The Author(s). 2017 Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.

that e-Learning in a Blended Learning (BL) design was needed. This set the stage for the development of a BL project to drive the integration of e-Learning into the undergraduate curriculum.

The process of initiating the e-Learning project was enabled by the successful application for grant funding to support staff and infrastructure development. At the time, the university was investigating moving away from a proprietary Virtual Learning Environment (VLE) to an open source VLE, but in the absence of any firm decision, an interim open source VLE was set up on a local Faculty server. This was branded "e-OT", which soon became embedded in the vernacular of the students and lecturers of the DOT. Students and lecturers were trained on the use of the VLE and e-OT was launched at the start of the 2010 academic year.

## Birds eye view of the integration of BL into the OT curriculum

The constructivist nature of PBL in medical education creates an appropriate foundation to be extended by the introduction of BL to the course delivery [6, 7]. One of the most commonly cited early definitions of BL is by Graham [8], "Blended learning systems combine face-to-face instruction with computer mediated instruction" (page 5), which he argues is encompassing of a variety of categories and approaches to BL but not that general as to apply to all learning modalities. This definition has expanded over time to acknowledge the integration of pedagogical approaches, a shift towards student-directed learning, student peer-to-peer collaboration, and accommodation of different student learning styles [6, 9, 10] which are all common traits with PBL [7].

A medium impact approach (components of the course are selected for development as online activities based on pedagogic merit) [11] to a program level [8] integration of BL was used over a 6 year Participatory Action Research (PAR) study. Savin-Baden and Wimpenny [12] describe PAR as having the goal of "creating knowledge to inform action" and is "conducted with people as opposed to on people". PAR is an iterative process of planning, acting, measuring, and reflecting/reviewing to influence the follow-up cycle [12, 13], with reflexivity that emerges from continuous in-action reflection [14].

Lecturers of the DOT are typically responsible for managing three to five problem scenarios within their field of interest, as well as the associated skills laboratories and clinical fieldwork, across the program. The problem scenarios were all developed and well established prior to this study [3–5]. During 2009, the lecturers and the Project Manager (PM) held curriculum development workshops (Table 1) and the PM attended curriculum meetings throughout the project to provide feedback and design new intervention strategies in line with the PAR cycles.

**Table 1** The introduction of BL over 6 year

| | |
|---|---|
| 2009 | • Established the e-Learning team (the PM and a graphic designer).<br>• Lecturer workshops on BL, the VLE tools and curriculum integration strategies. |
| 2010 | • Established a mini in-house computer centre with 10 computers and PBL rooms each had a computer and data projector installed.<br>• The VLE was branded "e-OT".<br>• Curriculum guideline books were issued on an interactive HTML based Compact Disk (CD) (previously a CD of Rich Text files).<br>• All student groups attended computer laboratory based training on the VLE and online resources.<br>• Online class tests were designed and administered for two occupational science modules.<br>• Wiki's were created on the VLE for PBL group collaboration.<br>• The 3rd year paediatric learning difficulties problem scenario was redesigned to include group wiki's, a formative assessment quiz, and interactive lessons.<br>• Developed an eBook for the 3rd year psychosocial module. |
| 2011 | • TCD's issued to students for 4th year rural fieldwork with pre-paid data to facilitate access to the VLE.<br>• Introduction of responders and an interactive whiteboard in the main lecturer theatre. 10 additional computers were installed in the in-house library.<br>• Lecturer shared cloud based folder for department documents and editing curriculum documents.<br>• Increased use of formative quiz, online class tests and written assignments submitted via the VLE across all levels of the curriculum.<br>• The e-Learning team appointed an Information Technology (IT) technician. |
| 2012 | • The server hosting the VLE was upgraded to cope with the increased traffic.<br>• Lecturers issued TCD's: mark student fieldwork, improve communication, present face-to-face content.<br>• Introduction of submitting video assignments for 1st year interview role-play.<br>• The e-Learning team appointed an instructional designer (who was also an occupational therapist and lecturer). |
| 2013 | • The curriculum books were migrated from the interactive CD's onto the VLE.<br>• Clinicians and external fieldwork supervisors were given access to the VLE areas applicable to their engagement with the students.<br>• Majority of written assignments were submitted via the VLE and plagiarism scanning software.<br>• International experts were live video streamed for upskilling workshops with the lecturers and postgraduate students on topics such as Evidence Based Practice and using Rache analysis in research. |
| 2014 | • Increased development of interactive multi-media lessons on the VLE for PBL modules in 2nd, 3rd and 4th year.<br>• Introduction of gamification in the "Who wants to be an ethics millionaire" game on the 4th year VLE.<br>• Students started using the data projector in each PBL session to collaborate electronically during the PBL process (replaced scribing on poster paper). |
| 2015 | • WebQuest to orientate 1st year students to the VLE and university online resources.<br>• Lecturers created podcasts to cover difficult content in 3rd and 4th year curriculum.<br>• Piloted the use of live video calling for supervision and case presentations for students at remote fieldwork sites.<br>• Students shared online resources via discussion forums and wiki's. |

Lecturers were encouraged to use the time they typically use in preparing for their PBL scenarios to consider content that could be learnt through the online activities, and consider the pedagogical value of the activity over prior content delivery methods. Student learning hours allocated to the PBL scenario remained unchanged; with the problem scenario introduction sessions, mid-problem tutorials and problem feedback sessions remaining face-to-face and students having sufficient resource time to complete the online activities and address the problem learning objectives. Table 1 provides an overview to the integration of BL into the PBL curriculum over the 6 years of the project. These activities were reviewed, updated and rolled-over to each consecutive year. Students had access to the VLE of their prior academic years as they progressed.

## Method of reflection

Critical reflection is the process of interrogating our experiences, questioning our assumptions, illuminating sociocultural power-relationships, postulating change and creating new action [15–17]. In health education, there is large emphasis on developing critical reflection skills in our students through the introduction of reflective journals and learning portfolios [15, 18, 19], particularly within PBL [20], but less focus is placed on health educators being critically reflective of their own teaching and learning practice. Mann, Gordon and MacLeod [19] in their systematic review of reflection and reflective practice in health education failed to even consider the value of the reflective practice of the health educator. Brookfield [16, 21] presents four lenses through which critically reflective practice in teaching can be investigated. Oldland [22] used this model to reflect on her professional development as a nurse educator in a structured format. The Brookfield model [16, 21] resonated with the scope of this study as it represented the perspective of each group of stakeholders; namely the autobiographical lens of the primary investigator, the lens of the students and the lens of the lecturers. The fourth lens considers the research literature and theory underpinning the study, in this context it pertains to blended learning and connectivism. Table 2 summarises the evidence contributing to each lens.

### Stakeholders

The Project Manager (PM) is the primary investigator in the study (Lens 1). She is an occupational therapist with a master's degree, pursuing a doctorate through the current study. She was a member of the DOT lecturing staff for 6 years prior to taking the position as the e-Learning PM. The e-Learning team started with the PM and a graphic/ web designer, and expanded during the study to include an IT technician and instructional designer. The instructional designer was also an occupational therapist with a master's degree, and lecturer with an interest in BL.

**Table 2** Evidence considered in each of the Brookfield lenses

| Brookfield (1998) Lens: | Evidence: |
|---|---|
| Lens 1: autobiography as a learner | Occupational Therapy BSc (1994) and MSc (2009): PM degrees attained through the DOT Online notebook collection of experiences and thoughts during the course of the study:<br>Tweets of content; pictures of interesting observations; field notes<br>Audio records of meetings, congress sessions, paper presentations, courses and workshops Prior learning – mother Computer Science teacher, learnt web design principles when managing an online publication<br>Roles: Faculty Information and Communication Technology Committee chair; VLE audit workgroup member<br>Awards: Vice Chancellor's team teaching award (2010); South African Association of Health Educators (SAHEE) congress poster prize (2012) |
| Lens 2: our students' eyes | Survey data: 3rd and 4th year students' experience of e-learning<br>VLE Footprint: access and uptake of using the VLE<br>Anecdotal commentary: students emails / conversations with the e-Learning team |
| Lens 3: our colleagues' experiences | Minutes of meetings: curriculum review and strategic planning meetings of the DOT<br>Survey data: Lecturer use of iPads (2012 and 2013)<br>Reflective interviews and focus groups: Individual interviews (2012), focus groups (2015) Performance effect: Paediatrics module and Psychosocial module analysis of student marks and pass rates<br>VLE Footprint: access and uptake of use of the VLE by lecturers over time<br>Anecdotal commentary: emails, corridor conversations |
| Lens 4: theoretical literature | Books and journal articles within the following topics:<br>•Connectivism<br>•Participatory Action Research<br>•Blended learning<br>•E-Leaning<br>•Mobile learning and mobile technologies<br>•Education theory<br>•Problem Based Learning |

The students (Lens 2) in the study were all undergraduate occupational therapy students from 2010 to 2015 (Table 3) who consented to participate in the research activities indicated in Table 1. The PM was not involved in any teaching or assessments of the undergraduate students of the DOT apart from introducing the students to the VLE and supporting their BL needs. She thus had no direct influence on student performance. Over time most students didn't even realise that the PM was a previous lecturer of the DOT.

There are two groups of lecturer participants in this study (Lens 3). The first group includes the 11 lecturers who were part of the inception of the BL project prior to the start of the 2010 academic year. This group will be referred to as lecturers. The second group includes five lecturers who joined the DOT through natural staffing turnover after the BL project was in process. This group will be referred to as the "ensuant lecturers". The PM conducted all the interviews and focus groups with the lecturers (Lens 3).

All stakeholders are considered possible participants in the study as is typical in PAR, thus no sampling strategy was applied. All lecturer stakeholders were active researchers within the PAR study contributing to all phases of the PAR cycles [13]. All lecturers and students were invited to participate in the various data collection activities described in Table 2. Those who consented to participate were included in the data collection activity. All participants were informed that there was no prejudice or risk to non-participation at any point and any-time withdrawal of consent to use data records was given.

### Data collection

Nine individual lecturer interviews were conducted during two to three-hour prearranged appointments in the DOT at the start of 2012. These were the lecturers who were part of the inception of the project and still members of the DOT after 2 years. The interviews were open ended and probing in nature, allowing the participant freedom to reflect on the development of BL within the occupational therapy curriculum over the prior 2 years.

All lecturers were invited to attend a two-hour focus group which took place in a meeting room at the DOT in mid-2015. They consisted of a group of four lecturers and a group of four ensuant lecturers. The focus groups were open-ended discussions of their experiences of BL.

Students were asked to complete electronic surveys at the end of the computer laboratory sessions dedicated to introducing and updating students to the VLE and BL resources. Informed consent was given by participants and students were under no obligation to participate. Participation rates were consistently over 65%. Responses to the short open questions were included as data for this paper.

Data such as the anecdotal commentary, meeting minutes, awards, experiences and personal reflections of the PM were electronically captured in an online journal.

### Data analysis

The interviews and focus groups were audio recorded and orthographic transcriptions [23] were produced by an external transcriber who has experience in transcribing medical and health related data. Transcriptions are not publicly available due to the small confined stakeholder group where full transcripts may have multiple identifiers placing confidentiality at risk. Strauss's grounded theory method [24] was used to code and analyse the collected data. The transcriptions and journal data were open coded using MaxQDA version 11 initially and migrated to version 12 [25] by the PM. Axial coding and constant comparison were applied to integrate the data and form the theory [14, 23, 24]. The coded files were reviewed by the e-Learning team's instructional designer as she has similar qualifications and experiences to the PM. This review was a random check of the coding consistency across the files, followed by a discussion and agreement on the code patterns and themes.

## Results

Through Strauss's grounded theory analysis [24] of the data presented in Table 2, two core categories were interpreted: 1) Drivers of change and 2) Outcomes of BL integration. The results present the evidence supporting the two core categories from the perspective of each of the Brookfield [16] critically reflective lenses, in order to give voice to each of the stakeholder groups within this PAR study.

**Table 3** Number of students first accessing and repeating each course level per academic year

| | First year<br>First access (Repeat) | Second year<br>First access (Repeat) | Third year<br>First access (Repeat) | Fourth year<br>First access (Repeat) |
|---|---|---|---|---|
| 2010 | 61 (0) | 37 (1) | 29 (3) | 37 (2) |
| 2011 | 37 (2) | 40 (1) | 41 (2) | 26 (9) |
| 2012 | 54 (0) | 44 (0) | 36 (6) | 33 (0) |
| 2013 | 45 (2) | 41 (1) | 40 (5) | 38 (0) |
| 2014 | 62 (0) | 47 (0) | 33 (8) | 37 (0) |
| 2015 | 61 (2) | 48 (1) | 39 (4) | 34 (1) |

## Critically reflective lens 1: Autobiography as a learner (*project manager's lens*)

Reflecting on professional experiences is subjective and hinges on the psychosocial state of the individual at the time. An autobiography is typically a recounting of life events that has brought an individual to a particular level of understanding and belief structure surrounding the topic of concern. Brookfield [16] specifically suggests that educators reflect on their own learning experiences, which have informed the way they craft their education practice. The experiences presented here have shaped the decision making and change facilitation process during the study.

### *Buy-in and goodness of fit (Core category 1: Drivers of change)*

The Project Manager (PM) had studied occupational therapy as a student in the DOT at both undergraduate and postgraduate levels, and subsequently joined the DOT lecturing staff. As an undergraduate student, the curriculum was delivered in a traditional lecture based format. The DOT transitioned to PBL before the researcher entered the DOT as a lecturer. The PM observed that PBL required both independent and group based learning allowing for the integration of BL without disrupting the timetable or basic structure of the curriculum. Institutional knowledge and a good understanding of the occupational therapy curriculum as a former student and current lecturer, enabled the PM to gain the trust of lecturers and students in the DOT. This trust opened doors to comprehensive buy-in to the BL concept and willingness to adapt the existing curriculum.

Nurtured by a mother who is a primary school teacher contributed to an innate foundation of teaching and learning practice for the researcher.

> Journal entry (2013): "I am not sure that I would have been able to do this job if mom hadn't chosen to get her teaching certification in computer literacy. I have a big advantage in growing up with home based computing skills ahead of my peers."

While in private practice, the PM developed a remedial and special education website and thus gained exposure to web design and online tools. This was largely self-taught, leading to confidence in being able to develop basic e-Learning skills, which could then be transferred to the lecturers of the DOT.

> Lecturer A, anecdotal commentary (2010): "We trust you – you know far more about this stuff than we do"

The lack of formal training in education theory and practice was however a concern for the PM, creating some anxiety at being responsible for change management that would have to be evidence based. The PM entered a fellowship programme in health science education (Sub-Saharan Africa - FAIMER Regional Institute [26]), which focused on building a community of health science educators, producing education research and developing the pedagogical skills of the fellows.

The researcher was consensually considered the "best man for the job" from the start of the project, illustrating a general goodness of fit, which resulted in strong buy-in from the lecturers of the DOT.

### *Just do it (Core category 1: Drivers of change)*

Decision making is often time sensitive. At the inception of the project it became apparent that the institution was changing the VLE and there was uncertainty about the timelines of the rollout of this change. Lecturers can be change averse, especially when it comes to understanding technology and software. Concerns were raised about having to start on one system and then migrating to an unfamiliar system. It was agreed that waiting would be a risk, which drove collaboration with the Faculty IT unit to house an interim VLE on a local server. Five years and two institutional VLE's later, the project is still on the same Faculty hosted VLE (though upgraded both in terms of server and software updates). The project started because a plan was made to "just do it".

Resilience was a trait used to describe the PM's approach to driving the process of integrating BL and maintaining momentum, creating a general ethos of "just do it".

> Lecturer B, anecdotal discussion (2015) about the PM: "You are tenacious and energetic, as in excited about the project and able to enthuse even the most obstinate naysayer. And it meant that despite some academic staff who were reluctant to try new things and scared of all things technology, you were able to get everyone on board and engaged in the project to the extent that these very hesitant/reluctant people are now running the content mostly by themselves. So, you have thus been able to ensure the sustainability of the program."

### *Support (Core category 1: Drivers of change)*

Management support lent credibility to the project for all stakeholders and mentored the PM in the prioritisation of decisions and management tasks at every point during the project. Financial constraints are regularly cited as a limitation to the success of a project [27]. This project was awarded substantial grant funding due to support by Faculty management. The budget has increased over time due to the perceived success of the project, allowing for expansion of the e-Learning team, facility upgrades, Wi-Fi

coverage of the building housing the DOT, increase in the number of computing terminals for student use, and provision of Tablet Computing Devices (TCD's) for lecturers. The funding allocated to this project afforded the technology enhancements that optimised the quality of BL integration.

The launch of the VLE was on a test server with relatively low processing power as the IT support services were cautious about the rollout of e-Learning. The system was initially stable, but as adoption of BL increased and lecturers became willing to try new methods of teaching and assessment, server capacity became an issue. This culminated in a system 'crash' during an online assessment when simultaneous student access overloaded the server.

> Lecturer B, personal correspondence (November 2010): "Backend glitches make the lecturer look incompetent in front of students. This produces a reluctant technology adopter. A very big barrier."

The VLE has since migrated to larger servers, twice, in response to the increased uptake of BL and the variety of plugins and online tools being actively integrated. Although there were initial challenges of server space, the Faculty IT unit has provided ongoing back-end support to the project. This highlights the risk factor if IT support is inadequate and how in this project has assisted with the sustainability as the PM has no server coding, setup or maintenance skills.

#### *Valued as a game changing project (Core category 2: outcomes BL integration)*

The success of a project can be evaluated by its recognition as a 'game changer' or when it stimulates groups outside of the target population to seek support for adopting the model set by the project. In October 2010, the project was awarded the Vice-Chancellor's team teaching award, a mere 10 months after inception. Early recognition at that level created a sense of belief in the project by all stakeholders and a determination that any hurdles could be taken in stride.

The PM was selected to be a member of the University VLE audit workgroup, further demonstrating that the project was respected for its advances and that the PM could contribute to the University's decision making process.

> Journal entry (2012): "A pivotal moment for me was at a Faculty function where [the Dean of the Faculty] pulled me aside to tell me that she saw me as a younger version of herself and that she was proud of the impact that I have made within the faculty. This brief moment in time has fuelled my confidence in what I am doing".

These experiences and learning opportunities have shaped the PM's lens. However, technology advances rapidly, which creates new challenges and opportunities for adaptation and innovation in BL. The prominent skill learnt is the ability of the PM to evaluate advances for value to the project, or to confidently reject those deemed less relevant.

## Critically reflective lens 2: our learners' eyes (*the students' lens*)

The students are the end-users of BL and the focus should therefore be on improving their learning experiences to enhance their academic performance. Critical reflection of their experiences can only be deemed true through their ability to give feedback anonymously [16]. This translates into responsive adaptation of BL according to the needs and preferences of the students. All surveys were anonymous, with the only identifier being the year of study.

#### *Primed for blended learning (Core category 1: Drivers of change)*

There is consistent evidence that the students enter the degree with the computing and online skills necessary to cope with BL [1]. Despite the early concerns of lecturers that students would be ill prepared for the digital literacy demands of BL, a survey of the third-year occupational therapy students during 2011 (N = 43), the second year of the study, indicated that 91.2% of the 34 respondents had access to computers during high school and 88.2% reported having a personal use laptop by the time of the survey.

In one class a student created a personal web page for the class to share information so that they could have a private work-ground.

> Ensuant lecturer A, focus group (2015): "She has made her own page as the class rep and any documents that I put up on e-OT she will also put up on the page. So I think she is a bit of techie whizz but she has […], her own personal website. And because I don't have access to said page which is fine, and I shouldn't have, […] and they can be completely honest with each other whereas obviously on e-OT there is a degree of caution and censorship you know; […] So they have really taken this whole e-Learning thing on board."

> Lecturer C, personal discussion (2013): "I often have students say to me 'Just put it on e-OT, ma'am'."

Both the quantitative and qualitative data reflect that the students are entering the curriculum primed for BL, and

they are starting to adapt and innovate towards their own preferred BL tools.

### *Feeling reassured (Core category 2: outcomes BL integration)*

The emergence of the feeling reassured theme through the lens of the learner showed two distinct sub-themes. For themselves, it was viewed as an enabler and a positive factor. Counter to that was a perception that for the lecturers the VLE provided a fall-back, and was thus a negative factor in the eyes of the students.

Having a VLE seems to provide the students with a feeling of reassurance in that all their curriculum information is in one 'go-to' place. It is accessible around the clock and maintains the history of the year-to-date. Three primary indicators were: a) students expressed that they access e-OT when they are unsure of something; b) access first thing in the morning to see if there is anything new that they should know for the day; and c) the access footprint indicated that students consistently access more frequently in the month prior to examinations suggesting that it forms part of their study pattern. The following quotes from students reflect their relative dependence on e-OT and how it is perceived as making them feel more secure in their day-to-day curricular activities.

> 4th year student A, anecdotal email (2014): "We rely on e-OT, especially before exams."

> 3rd year student A, survey (2010): "I like that it's easier to access than notice boards and I can check things whenever I am unsure or have time."

Students also perceive that some lecturers use the VLE as a fall-back for when contact time is not enough to complete a lecture or contact is cut it short in order to do something regarded as more important. Students' complaints about this were regular in the initial phases of implementing BL, as reflected by the following two student comments towards the end of the second year of e-OT.

> 4th year student B, survey (2012): "It is a dumping ground for unfinished business"

> 3rd year student B, survey (2010): "The lecturers tend to abuse it in that they use it as an excuse for rushing through a lecture. YES this REALLY bothers me! 'Specially coz I do listen in class… mostly."

As the lecturers have become more proficient in the integration of BL this issue seems to have diminished but is still worth noting for the early stages of a similar project. The implementation of BL in the curriculum seems to have given the students a sense of reassurance both in terms of freedom to express their opinions and in knowing that their learning materials are always accessible.

### *Communication (Core category 2: outcomes BL integration)*

There is a strong sense that having a VLE has facilitated both peer-to-peer and student-lecturer communication. Prior to and in the early stages of e-OT the student classes created a shared email account to which they emailed course notes, notices and other information. Each student then accessed the class email (via common username and password) in order to get the information. It was their self-created online information sharing space. For more urgent notices a mobile phone instant message tree was created so that lecturers could message class representatives who would then start the instant message tree to circulate the notice. Over the last 4 years both these practices have been discarded as students felt the VLE absorbed the function and gave added benefits such as access to two-way communication with the lecturers.

> 3rd year student C, survey (2010): "On the class email, stuff would get deleted before we all saw it. Now information will be posted and kept on e-OT."

> 3rd year student D, survey (2010) commented specifically on the instant message tree: "Everyone is able to see announcements from lecturers so no one is left out."

The above comments imply that students who had been involved over a few years felt marginalised in the earlier systems. It is clear that the students perceive the VLE to be a more equitable communication platform that provides peer-to-peer and student-lecturer engagement.

### *Instant gratification (Core category 2: outcomes BL integration)*

There are both positive and negative aspects to this theme with the build-up of habits and expectations of what content and information will be posted and when.

Time was a factor in terms of students having anywhere, any-time access to their course information. Two students reflected on the positives of instant access and immediate performance results:

> 4th year student C, survey (2012): "It is great that we have instant access to lecture notes, fieldwork information, marks etc."

> 4th year student D, survey (2012): "Quizzes and tasks on e-OT add novelty, plus instant results are a great benefit."

Time was also expressed as a frustration when knowing that information is available but not immediately accessible because of poor bandwidth or power outages (see also Hurdles to BL in Lens 3).

> 3rd year student E, survey (2010): "It is frustrating being unable to access when necessary due to internet difficulties"

Students noted that at times they anticipated that information would be posted within a (self-determined) time period and then finding that lecturers posted it later than expected. Many students agreed that test and assignment marks should be regularly updated so that they are able to monitor their own progress throughout the year. They suggested that lecturers post the notes before the lectures so that they can arrive prepared. It seemed that it was difficult for students to predict what information would be posted, and the students experienced some anxiety due to a sense of needing it all immediately. This issue was communicated to the lecturers during a curriculum meeting with the suggestion that they are alerted to the possible anxiety created and that communicating timelines would alleviate some of this tension.

## Critically reflective lens 3: our colleagues' experiences (*the lecturer's lens*)

The lecturers of the DOT were primary stakeholders in the PAR process and were actively involved in decision making, implementing actions and researching the outcomes. The lecturers were all female occupational therapists and ranged in academic experience from novice lecturer through to over 35 years.

### *Buy-in and goodness of fit (Core category 1: Drivers of change)*

Collaborative decision making is a strong tool for creating buy-in to a concept and for driving the participation of all stakeholders. The strategic planning meeting in 2009 provided the platform for the lecturers of the DOT to agree that e-Learning was a good strategy to improve throughput, cope with increased student enrolment numbers, and create time for research. This set the platform for shared goals and beliefs which are a cornerstone of PAR [13, 14]. A sense of team cohesion was evident in the lecturers.

> Lecturer D, individual interview (2013): "I think that your research took place when we had a good team in the department but I think having something like your project to keep things going and keep it exciting and have new things to do all the time has also been very nice for the team and given them a bit of a focus and a benefit to work towards something together. This kind of project may not work in a dissenting department."

### *Support (Core category 1: Drivers of change)*

The e-Learning team was physically located in the DOT. During interviews with the lecturers it frequently emerged that there was a sense of security in knowing that support from the project team was always available, whether to help set up a computer for media rich practical examinations or to help with showing how to do something on the VLE. This sense of availability and help at hand was a cornerstone to overcoming any hesitance on the part of the lecturers and consolidated the buy-in.

### *Just do it (Core category 1: Drivers of change)*

In the early stages of the study, many lecturers simply used the VLE as a document repository and communication portal, but as some lecturers tried new learning activities, others realised that if they 'just do it', they started seeing new opportunities to be innovative in their teaching.

> Ensuant lecturer B, focus group (2015): "In my module evaluation a student wrote "*Podcasts are the way of the future*" – They just loved that I did something different!"

> Ensuant lecturer C, email February (2014): "Thought you'd want to do a happy dance with me too… (just thought I'd share how I'm using e-OT more…☺) I created my own lesson plan with multi-level jumps, videos & quizzes – have a look when you have time and let me know how I can improve it for next year!!"

These innovative lecturers showed that it can be done, which created a natural competitiveness that prompted other lecturers to revise their modules and start using new tools or ask the e-Learning team for assistance in doing something new.

### *Success (Core category 2: outcomes BL integration)*

The determinant of success is usually considered to be an improvement in student performance (or at least outcomes that are equal to previous ones). Success has many forms; in this instance, it is seeing students actively engage with content that is sometimes tedious.

> Lecturer B, email discussion (August 2015): "Firstly, although I find understanding the legislative background of employing people with disabilities interesting, it is REALLY boring to the students. […] So I thought I would take a chance using podcasts and the lesson plan format on e-OT to help me "flip the classroom" a bit. I turned the lecture period into an e-Learning time with a face-to-face feedback session thereafter. Knowing students and the boring nature of the content I did not have high hopes. Until I went outside to go to the cafeteria for a quick coffee and one of the students called me over to clarify something and I saw little groups of students sitting on the grass around their tablets listening to the podcasts. I promptly forgot about the coffee, as I was amazed at the level of engagement that I saw regarding this boring content. It seemed that the students were far more willing to engage and they actually understood the concepts far better than previously."

Success can also be observed by improvement in the pass rate for the third-year paediatric assessment module, which we reported in Barnard-Ashton, Koch and Rothberg [28]. A cohort of 29 third year students (2010) who were novice to BL (introduced in that year) were compared to the 2011 third year students (n = 40) who were more experienced in integrating online activities with their PBL scenario exploration. Significantly higher ($p \leq 0.002$) rate of accessing the VLE resulted in a marks shift effect size of $d = 0.3$ and the class average shifted from a fail in 2010 to a pass in 2011 [28].

Success for the lecturers is an increase in the research publication output of the department. In the decade prior to this study the average number of publications in accredited journals was 2.4 papers per year. In the current decade, the average per year is 6.7 papers. It is widely acknowledged that a number of factors have contributed to this success, namely the introduction of writing retreats, increased number of postgraduate students converting their research into published work and a special edition of the South African Journal of Occupational Therapy dedicated to the 70th anniversary of the DOT [29]. Many of the lecturers feel that the introduction of BL has improved their skills in the use of technology in the research and writing process, and that increased efficiency in the curriculum delivery through BL has afforded time take advantage of the other contributing factors.

#### *Efficient use of resources (Core category 2: outcomes BL integration)*

The lecturers concurred that one of the best aspects of the project has been the efficient use of time and conservation of paper.

> Ensuant lecturer C, focus group (2015) "I do the whole train thing from Pretoria to here and that is a good solid hour that you are travelling, and with the iPad by the time I get to work all of my emails are answered, my to do list for the day done, so when I walk into the office I know exactly what it is I am supposed to be doing."

> Lecturer E, interview (2013): "To a degree it's part of the culture that we need to have a paper version in a file somewhere, […] but in terms of meetings and all of those things I have gone more paperless […] I mean with an iPad I can file it somewhere […], the physical paper is irritating […], it has decreased my use of paper."

Furthermore, lecturers felt able to provide students with feedback on their performance quicker, and good communication between lecturers and students meant fewer mishaps. Doing it electronically has a trail while paper in a pigeonhole can be claimed as lost.

#### *Transparency of the curriculum (Core category 2: Outcomes BL integration)*

A 4 year, full time degree has a complex interwoven curriculum that is difficult to fully conceptualise for both students and new lecturers. The VLE has become a central resource housing all the curriculum documents.

> Ensuant lecturer D, focus group (2015): "When I started, that's how I learnt what the curriculum was. I spent hours on e-OT seeing how everything fits and connects and what the objectives were. It was such a fantastic tool."

> Lecturer E, focus group (2015): "I always say it is not a state secret what we want you to know – The students know what the standards are....it is there."

#### *Hurdles to bended learning (Core category 1: Drivers of change)*

When looking at the drivers of change core category, consideration of the barriers of change emerged. Initially the lecturers' biggest perceived hurdles to implementing BL were their own computing skills. Concerns over students being distracted by social media were also evident.

> Lecturer A, focus group (2015): "I had one student watching a movie on his laptop, earphones in and all"

As students' and lecturers' computing skills and uptake of BL progressed, concerns shifted to infrastructure.

> Ensuant lecturer C, focus group (2015): "For me the biggest challenge was the capacity of the system in terms of bandwidth and Wi-Fi access."
>
> Lecturer A, focus group (2015) commented on the power company's scheduled power disruptions: "Load-shedding is creating a big problem but we are working around it."

The lecturer's attitudes to the use of BL have not been deterred by the perceived hurdles. Although infrastructure issues have disrupted online activities in the past, a campus-wide upgrade of the network and Wi-Fi is in process, while the upgrading of uninterrupted power supply to the network, the use of TCD's with long battery life, and monitoring the load-shedding schedules have been cited as addressing the perceived barriers.

### Critically reflective lens 4: the theoretical literature

At the project inception the participants knew little of how to ensure the successful implementation of BL. Review of the literature pertaining to BL and PBL was crucial and the PM attended international congresses to gain insights into best practice. Presented here are the key innovation trigger articles and academic events.

#### *Being evidence based - Learning theory (Core category 1: Drivers of change)*

Siemens [30] recognised that the more learners gained access to the internet the greater their access to information. This has fundamentally shifted the way learners learn, as knowledge no longer has to reside within the person but can reside externally. He felt that traditional learning theories such as behaviourism, cognitivism and constructivism all focused the need for learning to be internal, and thus review of our learning theories was required. Using the constructs of chaos theory, networked learning, complexity theory and self-organisation, he developed the theory of Connectivism, which he coined as a "learning theory for the digital era".

> Siemens [31] defines Connectivism:
> "Connectivism is focused on the process of forming and creating meaningful networks that may include technology-mediated learning, [and] acknowledges learning that occurs when we dialogue with others […]. Connectivism is strongly focused on the linking to knowledge sources … not simply trying to explain how knowledge is formed in our own heads."

Mentis (2008) supported the notion of Connectivism as the new age pedagogy for e-learning and BL environments. She considered the shift from traditional to emergent technology and the change in learning context from formal to informal as the platform for change in pedagogy towards self-directed learning which is ipsative and networked in nature [32]. In the last decade the support for Connectivism has grown and the impact of connected learning on teaching practice has emerged as a trend [33–36]. The theory of Connectivism thus formed the basis of decision making during the integration of e-Learning into the curriculum.

#### *Being evidence based - international expert network (Core category 1: Drivers of change)*

The PM attended two international congresses that profoundly contributed to the basis of knowledge development and expert network regarding BL. The EduLearn10 [37] congress in Barcelona exposed the eLearning Project team to international trends in BL and introduced the PM to Stephen Harris an Australian pioneer in BL [38]. This new network afforded the opportunity to visit The Sydney Centre for Innovative Learning (SCIL) and attend the Distance Education Hub (DeHUB) and Open and Distance Learning Association of Australia (ODLAA) Summit 2011–2021 [39]. This Summit exposed the PM to leaders in the field such as Terry Anderson and Grainne Conole. The visit to SCIL was a game changer – observing blended classes with adapted learning environments (camp fire, watering hole and cave spaces) at the intersection between pedagogy, virtual space and physical space [38]. Following their social media profiles and publications has given ongoing insight into their perspectives, research, presentations and innovations in learning, providing the PM with inspiration and ideas of BL integration opportunities for the study.

## Discussion

The results of the grounded theory analysis of the qualitative data collected during the 6 year process of medium impact [11] integration of BL at the program level [8] of the undergraduate occupational therapy curriculum, were presented using the Brookfield [16] critical reflection lenses to consider the perspectives of the stakeholders in the study. The results indicated two core categories to contribute to furthering our understanding of the process of integrating BL into an existing PBL curriculum.

#### *Core category 1: Drivers of change*

Within the core category of "drivers of change" consideration should be given to the driving force and the antonymous perspective as a possible barrier to change when considering integrating BL into a PBL curriculum. A primary driver of change in this study was that of buy-in and goodness of fit. From both the lens of the PM and the lecturers, the sense of team cohesion, collaborative decision making, and the PM's history with the DOT as a

lecturer with perceived IT skills created a level of trust allowing full buy-in of the DOT to the process. An overall attitude of all stakeholders to "just do it" created a level of momentum within the process. Lecturers noted that the resilience to the naysayers and enthusiasm of the PM sparked them into trying new learning activities, which in turn created examples to others that if you just do it, it can be done. The PM lead by example in not waiting for an institutional VLE installation but finding an opportunity to collaborate with the Faculty IT for a local VLE.

Being evidence based through the lens of the literature provided the PM with the theoretical framework of connectivism and the expert role models to shape her strategies in guiding the process. While true connectivism is still what we strive for, evidence of students and lecturers accessing international experts (Table 1), collaborating via self-mediated online spaces (Lens 2) and the complete shift in how students access information indicates that connectivism is becoming embedded in the curriculum. Viewing the students as being primed for blended learning gives validity to this as a learning strategy, but for the lecturers and the PM a key driver is having support: management endorsing the project, budget to increase staff and technology capacity, technical support from Faculty IT and the e-Learning team were viewed as accessible and always willing to help lecturers and students. The primary hurdle to BL that remains within this context is the infrastructure as South Africa continues to be plagued with power outages [1], but with the rollout of the University network upgrade, higher capacity power backup are being installed and the use of mobile technologies is seen as a way forward.

In this study, we were fortunate that these drivers of change were possible and taking advantage of them has created a momentum and level of sustainability to the project. It would be valuable for others considering a similar process to evaluate their context for plausibility of creating these drivers of change.

#### *Core category 2: outcomes BL integration*

The integration of BL was initiated through a strategic plan of the DOT to pro-actively combat the massification trends in South African higher education [1] and the threat this creates to workload and the ability of the DOT to produce research output. Over the 6 years of the project the lecturers and students have noted improved communication, curriculum transparency and efficient use of time and paper resources, which in turn accommodates the student need for instant gratification as suggested by Johnston [1]. Managing the expectation of instant access that BL created, reinforced the need for clear communication between the lecturers and students.

Students felt reassured that they had the correct information and any-time access to all communication resulting in the use of BL becoming part of their study habits. The lecturers perceived success in seeing students actively engaged with BL activities and evidence that BL was contributing to improved pass rates [28]. The DOT has increased the average number of research papers produced per year when compared to previous years, and while this cannot be solely ascribed to the introduction of BL, it also cannot be excluded as a contributing factor. The integration of BL into the undergraduate occupational therapy curriculum has been valued as a game changer, receiving recognition within the University and local health education community.

#### *Critical reflection using the Brookfield [16] Lenses*

Most models of critical reflection in practice focus on two main aspects: reflection-in-action and reflection-on-action [40], or provide categories of topics on which to reflect [15]. In health education critical reflection is largely focused on the development of critical clinical reflection in students as a skill [15]. Interestingly, Snowball and Mostert [41] presented their study on introducing blended learning in a first year accountancy course from three perspectives: the students, the lecturers and the educational technologist; inadvertently validating the stakeholder lenses included in the Brookfield [16] model. The reflection phases of using a PAR design should represent all stakeholder experiences [12, 13], the Brookfield [16] model synchronised well with the stakeholder groups and allowed for the influence of existing theory. This model entices a person to step into the embodiment of other stakeholder groups and set preconceptions aside, while acknowledging your own beliefs and positionality within the process. It is a useful tool in guiding reflection specifically in the context of changing practice in higher education.

## Conclusion

Reflecting, using the Brookfield [21] lenses, on the process of integrating e-Learning into an undergraduate curriculum considered the perspectives of the PM as a learner, the students' experiences, the lecturer's experiences and the contribution of BL theory. This process highlighted the key drivers of change and the outcomes evident of the contribution of BL to the stakeholders, leaving a strong sense of "there is no going back" among the lecturers and students of the DOT.

**Abbreviations**

BL: Blended learning; DOT: Department of occupational therapy; IT: Information technology; PAR: Participatory action research; PBL: Problem based learning; PM: Project manager; TCD: Tablet computing device

## Organisation abbreviations

DeHUB: Distance Education Hub; FAIMER: Foundation for Advancement of International Medical Education and Research; ODLAA: Open and Distance Learning Association of Australia; SAFRI: Sub-Saharan Africa - FAIMER Regional Institute; SCIL: The Sydney Centre for Innovative Learning

## Acknowledgements

We would like to thank the following:

- Janine van der Linde (e-Learning team instructional designer) for her assistance in the data coding review.
- The e-Learning project team for their dedication to BL
- The lecturers and students of the DOT for their commitment to the PAR and integration of e-Learning into the curriculum.

## Funding

This study reflects on part of a larger curriculum development e-learning project which was funded by a faculty designated allocation of the Clinical Throughput Grant awarded by the South African Government's Department of Higher Education and Training. The funder has in no way influenced the design of the study or the scope and content of this manuscript.

## Availability of data and materials

The datasets generated during and/or analysed during the current study are not publicly available due the qualitative nature of the study and the small number of participants which may compromise confidentiality should full transcripts be released. Datasets are available from the corresponding author on reasonable request.

## Authors' contributions

PB-A was the project manager, conducted the study, analysed and triangulated the qualitative data, and was the main contributor to writing the manuscript. AR and PMI supervised the study since the inception and assisted in writing and editing the manuscript. All authors read and approved the final manuscript.

## Ethics approval and consent to participate

This study is one aspect of a larger PhD study for which the ethical clearance was obtained through the Human Research Ethics Committee of the University of the Witwatersrand (M090920 in September 2009 and extended M160877 in August 2016). Informed consent was obtained from all participants and stakeholders throughout the data collection process for data to be used and published for research purposes.

## Consent for publication

Participants consented to anonymised publication of quoted extracts of interview transcriptions and survey responses. All quotes extracted from email communications have separate consent from the correspondent for publishing their quoted statements.

## Competing interests

The authors declare that they have no competing interests.

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## Author details

[1] School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand. Affiliated to the Department of Occupational Therapy, 7 York Road, Parktown, Johannesburg 2193, South Africa. [2]School of Therapeutic Sciences, Faculty of Health Sciences, University of the Witwatersrand, 7 York Road, Parktown, Johannesburg 2193, South Africa. [3]Centre for Health Science Education, Faculty of Health Sciences, University of the Witwatersrand, 7 York Road, Parktown, Johannesburg 2193, South Africa.

**Received: 14 September 2016 Accepted: 10 August 2017**

Published online: 17 August 2017

### References

1. Johnston K. A Guide to Educating Different Generations in South Africa. Issues in Informing Science & Information Technology. 2013;10:261–73.
2. The Council on Higher Education. Higher Education Monitor - Access and Throughput in South African Higher Education: Three Case Studies, vol. 9. Pretoria: The Council on Higher Education; 2010.
3. De Witt P, Rothberg A, Bruce J. Occupational therapy manager's role in and perceptions of clinical education. S Afr J Occ Ther. 2014;44:09–13.
4. Jay J. Problem Based Learning-a review of students' perceptions in an Occupational Therapy undergraduate curriculum. S Afr J Occ Ther. 2014; 44(1):56–61.
5. Jacobs L. The other side of the coin: OT students' perceptions of problem based learning. S Afr J Occ Ther. 2014;44(1):62–7.
6. Ilic D, Hart W, Fiddes P, Misso M, Villanueva E. Adopting a blended learning approach to teaching evidence based medicine: a mixed methods study. BMC Med Educ. 2013;13:169.
7. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. Med Teach. 2008;30:455–73.
8. Graham CR. Blended learning systems: Definition, current trends, and future directions. In: Bonk CJ, Graham CR, editors. Handbook of blended learning: Global perspectives, local designs. San Francisco: Pfeiffer Publishing; 2006. p. 3–21.
9. Poon J. Blended Learning: An Institutional Approach for Enhancing Students' Learning Experiences. J Online Learn Teach. 2013;9(2):271.
10. Wang Y, Han X, Yang J. Revisiting the Blended Learning Literature: Using a Complex Adaptive Systems Framework. J Educ Technol Soc. 2015;18(2):380–93.
11. Alammary A, Sheard J, Carbone A. Blended Learning in Higher Education: Three Different Design Approaches. Australas J Educ Technol. 2014;30(4):440–54.
12. Savin-Baden M, Wimpenny K. Exploring and Implementing Participatory Action Research. J Geogr Higher Educ. 2007;31(2):331–43.
13. Creswell JW. Action Research Designs. In: Educational Research: Planning, Conducting, and Evaluating Qualitative and Quantitative Research. 4th ed. Boston: Pearson; 2012. p. 576–601.
14. Cohen L, Manion L, Morrison K. Research methods in education. 7th ed. Oxon: Routledge; 2011.
15. Ng SL, Kinsella EA, Friesen F, Hodges B. Reclaiming a theoretical orientation to reflection in medical education research: a critical narrative review. Med Educ. 2015;49(5):461–75.
16. Brookfield SD. Becoming a critically reflective teacher. 2nd ed. San Francisco: Jossey-Bass; 2017.
17. Cornish L, Jenkins KA. Encouraging teacher development through embedding reflective practice in assessment. Asia Pac J Teach Educ. 2012; 40(2):159–70.
18. Henderson E, Berlin A, Freeman G, Fuller J. Twelve tips for promoting significant event analysis to enhance reflection in undergraduate medical students. Med Teach. 2002;24(2):121–4.
19. Mann K, Gordon J, MacLeod A. Reflection and reflective practice in health professions education: a systematic review. Adv Health Sci Educ. 2009;14(4):595.
20. Williams B. Developing critical reflection for professional practice through problem-based learning. J Adv Nurs. 2001;34(1):27–34.
21. Brookfield S. Critically reflective practice. J Contin Educ Heal Prof. 1998;18(4): 197–205.
22. Oldland E. Transition from clinical manager to university lecturer: a self-reflective case study. Higher Educ Res Dev. 2011;30(6):779–90.
23. Braun V, Clarke V. Successful qualitative research: a practical guide for beginners. London: SAGE Publications Ltd; 2013.
24. Corbin J, Strauss A. Basics of qualitative research: Techniques and procedures for developing grounded theory. Fourth ed. California: SAGE Publications Ltd.; 2015.
25. Kuckartz U. MaxQDA 12.Version 12.1.4. VERBI Software GmbH: Berlin, Germany; 2016.
26. Sub-Saharan Africa - FAIMER Regional Institute: Graduates - Sub-Saharan Africa - FAIMER Regional Institute [http://safri.faimerfri.org/graduates/] Accessed 10 June 2016.
27. Dillenbourg P. Integrating technologies into educational ecosystems. Distance Educ. 2008;29:127–40.
28. Barnard-Ashton P, Koch L, Rothberg A. The influence of blended learning on student performance in an undergraduate occupational therapy curriculum. S Afr J Occ Ther. 2014;44(1):75–80.

29. Concha M. Occupational therapy at the University of the Witwatersrand – The past, the present and the future. S Afr J Occ Ther. 2014;44(1):1–2.
30. Siemens G. Connectivism: A learning theory for the digital age. Int J Instr Technol Dist Learn. 2005;2(1):3–10.
31. Siemens G: Connectivism: Learning theory or pastime of the self-amused? [http://www.elearnspace.org/Articles/index.htm] Accessed 15 June 2016.
32. Mentis M. Navigating the e-Learning Terrain: Aligning Technology, Pedagogy and Context. Electron J eLearn. 2008;6(3):217–26.
33. Wang Z, Chen L, Anderson T. A Framework for Interaction and Cognitive Engagement in Connectivist Learning Contexts. Int Rev Res Open Dist Learn. 2014;15(2):121–41.
34. Dunaway MK. Connectivism. Ref Serv Rev. 2011;39(4):675–85.
35. Cowan P, Neil PS, Winter E. A Connectivist Perspective of the Transition from Face-to-Face to Online Teaching in Higher Education. Int J Em Technol Learn. 2013;8(1):10–9. doi:10.3991/ijet.v8i1.2346.
36. Conole G, Galley R, Culver J. Frameworks for Understanding the Nature of Interactions, Networking, and Community in a Social Networking Site for Academic Practice. Int Rev Res Open Dist Learn. 2011;12(3):119–38.
37. EduLearn10: EduLEARN10: 2nd International Conference on Education and New Learning Technologies [https://library.iated.org/publications/ EDULEARN10] Accessed 25 July 2016.
38. Harris S. Embedding Research and Innovation into Everyday School Practice: The SCIL Story. Barcelona, Spain: Edulearn10 Proceedings: 5–7 July 2010; 2010. p. 3184–93.
39. Distance Education Hub: DeHub and ODLAA Summit 2011–2021 [http:// wikieducator.org/DEHub/Resources/DEHub/and/ODLAA/SUMMIT/ Presentation/PowerPoints] Accessed 25 July 2016.
40. Giaimo-Ballard C, Hyatt L. Reflection-in-Action Teaching Strategies Used by Faculty to Enhance Teaching and Learning. Networks: An Online Journal for Teacher Research. 2012;14(2):1–11.
41. Snowball J, Mostert M. Introducing a Learning Management System in a large first year class: Impact on lecturers and students. S Afr J Higher Educ. 2010;24(5):818–31.

Submit your next manuscript to BioMed Central and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in PubMed and all major indexing services
- Maximum visibility for your research

Submit your manuscript at
www.biomedcentral.com/submit

BioMed Central

# Chapter 7. Discussion and Conclusion

## 7.1. Context of the thesis

The undergraduate occupational therapy curriculum at WITS is delivered through PBL as a four-year Bachelor of Science degree[138,145]. There are 11 full time academic posts in the DOT of which one is typically divided into two-part time posts, which results in 12 lecturers participating in the undergraduate curriculum. Eleven lecturers were actively involved in this research at any given time due to natural staff turnover, sabbatical leave and maternity leave. The student body consists of a first-year intake of 60 students which remains predominantly white and female. The admissions policy for the Faculty of Health Sciences mandates transformation through categorising the admissions[190]. Students who are top academic performers form 40% of the intake, 20% is allocated to students from rural schools, 20% from poorly resourced schools and 20% is allocated to top achieving African and coloured students who were not included in the abovementioned 40%[190]. This has facilitated a larger intake of African and coloured students which now forms approximately 30% of the occupational therapy student body, bringing a diversity of culture, education and socio-economic backgrounds into the student body.

The Education White Paper 3: A programme for the transformation of higher education of 1997[5] was issued to facilitate 'increased and broadened participation' in a higher education system which is 'responsive to societal interests and needs' and fosters 'cooperation and partnerships in governance'. The two decades since have seen a doubling of the intake into the occupational therapy degree courses,[156] and admissions are set to continue to rise through the massification mandate to improve the higher education participation rate of South Africa[5,10]. Despite the rapid increase in student numbers the academic staff numbers have remained constant, although one post has been converted into a development post to be allocated to a young African academic. This is a temporary post with the view to preparing the academic for a junior lecturer position. This stark rise in the lecturer:student ratio in the DOT has placed significant pressure on the lecturer workload. The research output and postgraduate throughput have suffered, and student completion rates were of concern.

## 7.2. Objective A: Establish the platform and train the lecturers

Objective A of this research was to establish a stable VLE that would not be impacted by the WITS ICT migration processes, and train the lecturers on the tools and pedagogy associated with BL

The DOT conducted an internal audit in 2008, which concluded that the inclusion of e-learning into the undergraduate curriculum was a possible strategy to cope with the massification and increasing diversity of the student body. WITS was in the process of abandoning a proprietary VLE in favour of an open source platform. The Deputy Vice Chancellor of Knowledge and Information Management instituted a 'home grown' VLE which for four years failed to deliver a stable integrated platform. I recognised the risk associated with adopting an unstable platform while there was still lack of institutional decision confirming the permanence of that VLE. Investigation of available open source VLE's resulted in collaboration with our Faculty ICT manager to install Moodle[191] onto a local server to provide a VLE that could be consistent throughout the PAR process, forming a stable variable, isolated from the influence of the state of the WITS VLE. This proved a wise decision as in 2010 WITS instituted a third-party evaluation of the WITS VLE as compared to other open source VLE platforms, in which the WITS VLE was found to be inadequate.[186]. The report suggested that both Moodle[191] and Sakai[192] were similar in terms of functionality but recommended Sakai as the most viable option as it would be marginally cheaper to integrate, another similar local university was successful at integrating Sakai and could thus provide local support, and more of the top 100 ranked universities at the time were implementing Sakai over Moodle[186]. Despite the institutional migration to Sakai the DOT collectively decided that Moodle was becoming part of the teaching and learning process and migration would only occur when all were satisfied that Sakai was stable and offered like-for-like features. This has not yet occurred.

The Department of Nursing Education has been trying to implement the WITS installation of Sakai as their VLE over the last five years, but has now sought support as they find the user interface difficult to navigate, and the tools available are structured in a very limiting manner. One of the lecturers attempted to create a lesson in Sakai as illustrated in Figure 7.1, but found the Moodle user interface to be more practical and intuitive. She was able to incorporate more learning activities and resources as illustrated in Figure 7.2. The Department of Nursing Education has now fully migrated their online learning to the Moodle VLE alongside the DOT. Experience has therefore been that migration to the WITS installation of Sakai as a VLE would have been detrimental to the students and the DOT.

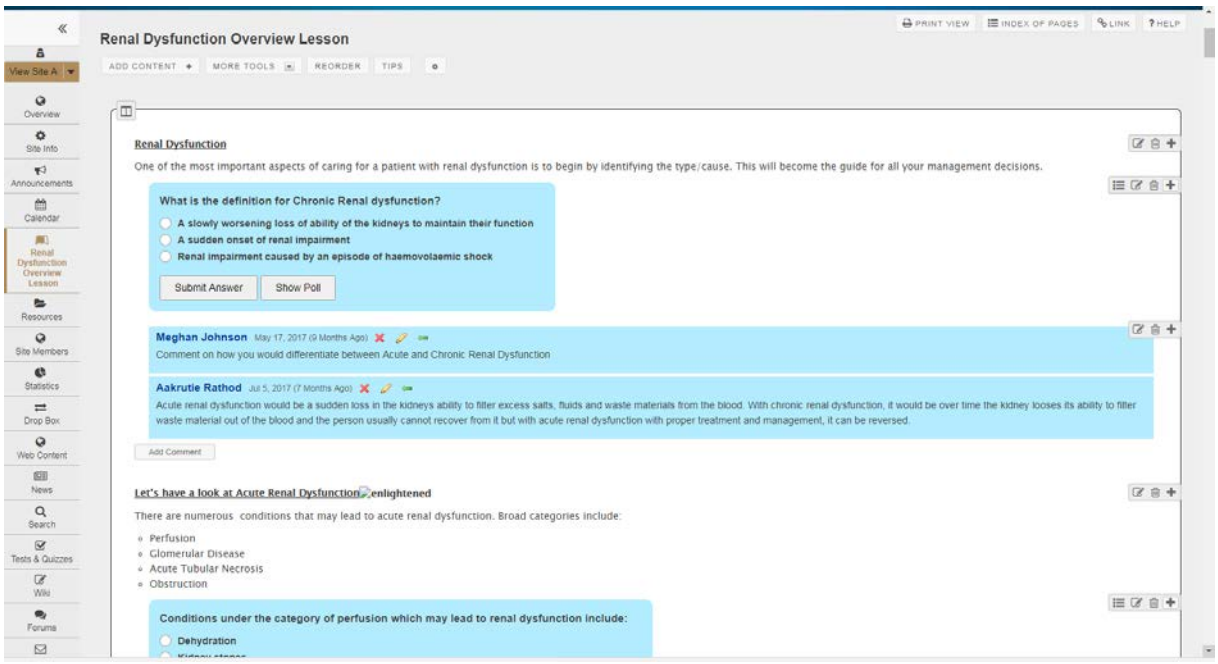



*Figure 7.1 Nursing - Renal conditions module on Sakai*

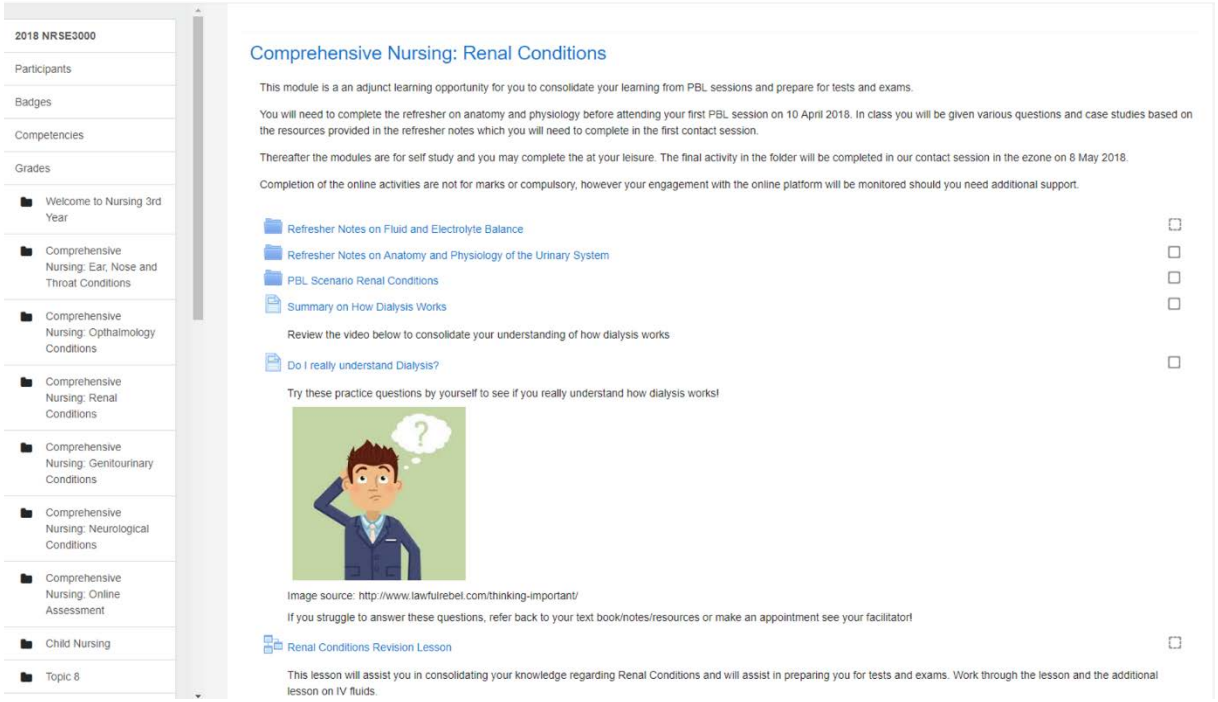



*Figure 7.2 Nursing - Renal conditions module on Moodle*

Objective A was addressed by maintaining Moodle on a local Faculty server and providing lecturers of the DOT with training and support in developing their BL activities. Paper 1 addresses objective A by providing a view of the PAR at the end of the first term of implementing BL within the PBL curriculum. It describes the intervention process, including the introduction of the VLE, branding the VLE as e-OT (Figure 1 of paper 1, p. 50), training the lecturers, and supporting the use of the VLE as more than a document repository. A

review of the lecturer access logs revealed that all were regularly accessing the VLE, with 83.3% contributing content to the third-year course. A survey of the 12 lecturers participating in the PAR at the time revealed that they felt that the VLE was a way of providing learning materials to the students (97.92%), that it was a support for student learning (87.50%), that it supported their teaching (79.55%) and that it made them more enthusiastic about their teaching (70.83%). At this stage the lecturers acknowledged that they mostly used the VLE to post lecture notes and announcements, but posting of video clips, using the discussion forum and designing learning modules was increasing. Lecturers reported that the students were enthusiastic about using the VLE and appreciated the availability of the learning resources provided, with almost all students regularly accessing the VLE. Their primary concern was that the WITS network infrastructure impacted the stability of the bandwidth on campus, and that a class quiz had crashed due the server not having sufficient capacity to support the simultaneous access of the whole class into a single activity. The lecturers felt that the one advantage that the WITS VLE had at the time was plagiarism scanning software and that this tool would be useful if integrated into Moodle.

There was an overall agreement that the integration of BL into the curriculum was thus far successful, and that the hurdles experienced were insufficient to warrant abandoning the process. Lecturers and students held a sense of ownership of the VLE largely supported through the branding of the VLE as ‘e-OT’ and there was a generally positive attitude towards the integration of BL.

## 7.3. Objective B: Orientate students to the platform and address digital literacy

Objective B of this research was to orientate students to the VLE and other online resources with the view to improving their digital literacy and engagement with BL opportunities.

At the start of each academic year since 2010 the students of all four years have participated in a computer laboratory session to orientate them to the VLE and other online tools and applications. From 2010 to 2014 this was done as a F2F session with a step-by-step approach while students follow along on the laboratory computer. By 2014 the students in their third and fourth years complained about having to attend a session when they were proficient at using the VLE, despite the fact that a few additional tools had been introduced at these levels e.g.use of referencing software and research-related software. The decision was taken to only introduce and orientate the incoming first-year students as there was sufficient evidence that by second year the students were actively using the VLE, and any additional tools could be introduced via the VLE. The frustrations of the step-by-step approach to

orientating the students was raised as an issue as, with the increase in student numbers and a more diverse student group, the pace of the programme was hard to maintain.

Paper 2 describes the digital access (hardware and internet) and digital literacy of the first-year students in the first two weeks of their degree courses. The paper presents the process of introducing a WebQuest[187] as an activity for orientating the students to the VLE and online resources, and considers how the occupational therapy and physiotherapy first-year students over three consecutive years experienced the WebQuest.

The results indicated that the students were better prepared in terms of access to computing hardware and off-campus internet than anticipated, with only one student over the three years of the study having no access to hardware or bandwidth. Students rated their digital media proficiency on a 10-point scale, with the occupational therapy students having a mean rating of 7.24 to 7.95 per year cohort. Only 7.6% of the occupational therapy and physiotherapy first-year students rated their digital media proficiency as poor (≤5).

In surveying the student experience of the WebQuest, the majority of the students considered the level of difficulty of the WebQuest as 'just right' and they felt it was beneficial to their learning as it was relevant to the skills they needed for their studies. The students felt that the WebQuest made the learning process more interesting, but there was less certainty regarding their enjoyment of it. It was interesting to note significant differences between the first cohort of occupational therapy students to participate in the WebQuest from the two that followed, suggesting that there is a possible relationship between how easy the students find the WebQuest to their perception of how beneficial it is to their learning, how interesting it makes the learning process and their enjoyment of the WebQuest, and the first cohort was generally more positive on all four variables.

The students of the DOT no longer realise that the VLE is a relatively new addition to the curriculum. It is noteworthy that all first to third year students have accessed the VLE within the last week despite it being vacation time (as at the 15th April 2018), while the fourth-year students are on clinical fieldwork resulting in reduced access (see paper 4).

## 7.4. Objective C: Collaborate with individual lecturers to address micro-level issues

Objective C of this research was to identify micro-level issues during the integration of BL, collaborate with individual lecturers to develop and implement an intervention, and measure the outcomes associated with the intervention.

While several micro-level issues were raised throughout the research there were two which stood out. The question arose as to whether we really were making a difference to the student success rates by implementing a large portion of BL activities within a PBL scenario, particularly in the third year of study where the pass-rate of the occupational therapy course was concerning. Secondly there was concern regarding effectively combatting 'digital apartheid' by the fourth year of study, particularly during rural fieldwork where students were away from home and residences. Papers 3 and 4 addressed these issues accordingly.

Paper 3 presents evidence from the literature supporting the 'no significant difference phenomenon' in education research. This highlighted the challenge of having insufficient student numbers to have power to detect significance[173,193], and supported the use of effect size to determine the impact of an intervention. Effect size was thus used in the statistical analysis in papers 3 and 4.

The success rates of students through the degree remains a concern. As presented in Figure 1.2 p. 11, the success rates of African and coloured students lags far behind the white and Indian students. Within the DOT the 2014 first year intake was 64 students, with the following demographics: 35 white students, 14 African students of which five were male, 11 Indian students and four coloured students. In 2017, the year they were due to graduate, only 23 white students (65.7%) and five Indian students (45.5%) received their degree. There were no African or coloured students who succeeded in completing the degree without repeating a year. Paper 3 considers the influence of habituation to BL activities on the third-year paediatric PBL module on the pass rates for that module.

The ten-week PBL module presented in Paper 3 was designed using two paper-based client scenarios, with videos of these clients to provide real-world authenticity. Apart from the PBL group sessions the students attended a number of F2F skills laboratories and participated in online learning activities, namely: a collaborative Wiki, a formative pre-clinical quiz, a compulsory interactive lesson, optional formative interactive lessons and accessing the content repository. In the years prior to this study, the class average for this module was typically below the pass mark, with nearly half the class failing the module. Habituation to BL was measured through the student access foot-print on the VLE during the 10 weeks of the PBL module. There was a significant difference ($p \leq 0.002$) in the per-student average access rate between the novice cohort and the habituated cohort, confirming that the habituated cohort were more comfortable with BL and accessed the VLE more frequently than the novice cohort as seen in Table 1 of Paper 3, p.71.

The comparison of student performance on the practical competency assessment showed a small effect size ($d=0.28$), with a similar effect size ($d=0.31$) for the end-of-module knowledge

assessment. This effect is important, as the pass rate for the novice cohort was 48.3% compared to the 57.5% pass rate of the habituated cohort. Students who are more comfortable with the BL process appear to be at an advantage relative to their less-habituated counterparts. Many studies on the impact of BL are short-term, with the students first exposure to online learning activities (thus they are novices to BL) being compared to traditional teaching methods with which they are more familiar. Most of these studies fail to provide evidence of the success of BL[173,193-196]. Paper 3 presents a longer-term impact where students transition from novice to habitual users of BL year-on-year throughout their course. By integrating BL into all years of the undergraduate occupational therapy curriculum the students view it as a normal part of how they study; it is nothing new!

'Digital apartheid' was raised as an early concern of the lecturers (refer to 1.3 p. 14). This was addressed through installing a small in-house computer laboratory within the DOT building and placing a networked desktop in each of the PBL tutorial rooms. The Wi-Fi and network switches to the building were upgraded in 2009 during a building renovation. Despite the upgrade, the connectivity in the building remained somewhat unstable due to the end-of-life status of the WITS network backbone and core. A full upgrade of the network infrastructure is currently underway but this has not yet reached the DOT building. Students also have access to campus computer laboratories, and evidence from Paper 2 suggests that most students have personal computing hardware and internet access off campus. The fourth-year of the occupational therapy degree consists mostly of clinical fieldwork rotations, with only 4 weeks of the fourth-year curriculum being on campus. Of particular concern was the rural fieldwork rotation during which the students are away from home in a public heath setting >300km from WITS. The rural environments are poorly resourced and student placement at a rural hospital often denies students access to University-networked computers. Paper 4 explored the impact of returning to a potential state of 'digital apartheid' through placement in a rural setting, and whether providing the students with a Tablet Computing Device (TCD) with pre-loaded data would effectively combat this.

While the study presented in Paper 4 was limited in the small sample size due to a particularly small fourth-year class at the time, the results were relevant in considering how fieldwork placements may be subjecting the students to 'digital apartheid'. The students self-reported perceptions of their knowledge and ability when rating the learning objectives of all their fieldwork rotations, prior to and post all fieldwork, were noted using a 5-point Likert scale. Students were blinded to the fact that the study was concerned with the rural fieldwork learning objectives. The control group did not have access to the TCDs or additional pre-paid data while the experimental group did. As expected, there was a significant difference in the pre-post test data for all fieldwork learning objectives as the students gained experience in those areas while on the fieldwork rotation.

Of value is the outcome of a significantly larger effect of the students' access through the TCD on their self-reported knowledge gain for the experimental group's rural fieldwork learning objectives as compared to their own other fieldwork learning objectives, and as compared to all learning objectives of the control group. The control group's perceived knowledge gain for the rural learning objectives was similar to that of their and the experimental groups' other fieldwork learning objectives. This finding indicates that the control group were at no greater disadvantage while on the rural fieldwork than when on other fieldwork placements. This study also revealed the hidden element of 'digital apartheid' across all fieldwork. Further investigation revealed that most urban clinical placements do not allow students access to their network via the placement computers nor the placement Wi-Fi. Students are limited to only accessing from home or campus during these times, which disadvantages the students who are unable to afford the prohibitive costs of mobile data.

Paper 4 points to the need for negotiation with clinical placements for student access to the network. This may improve students' performance by allowing access to as-needed information via the VLE and other validated online resources. Alternatively, if affordable, the provision of TCDs for the placements where access to the network is limited should be considered.

## 7.5. Objective D and E: Stakeholder reflection of the macro-level of the research and suggested guidelines for Blended Learning integration

Objective D of the thesis was to critically reflect on the macro-level integration of BL on the undergraduate occupational therapy curriculum from the perspectives of each stakeholder group in order to observe the effect and specify the learning and development that took place. Objective E of this thesis was to offer a guideline for other departments engaging with integrating BL into their undergraduate therapeutic sciences curricula, particularly within the context of PBL. These objectives are addressed together as the outcome of integrating the stakeholders' reflections provides the guidelines.

Paper 5 presents a reflection of the views of the stakeholders over the six years of the study. This is a long-term reflection, thus again contributing to a broader impact of BL than the many short-term, novice-user studies typically presented when investigating BL. Brookfield[189] proposed four lenses through which critically reflective teachers can reflect on their teaching practice. These were used to qualitatively analyse the data from all stakeholders as presented in Table 2 of Paper 5 p. 84. Two core categories emerged which contribute to a practice guideline: Drivers of change and Outcomes of BL integration.

### 7.5.1. Drivers of change

Six drivers of change emerged as influencing the process of integrating BL into the undergraduate occupational therapy curriculum, having potential to either positively or negatively impact the outcomes of BL. These drivers of change should be considered as key elements when initiating the process of integrating BL into a PBL curriculum in similar settings.

#### *7.5.1.1. Buy-in and goodness of fit*

Buy-in from all stakeholders was a key change agent. The collaborative decision by the staff of the DOT in the 2008 internal audit was supported by the head of the School of Therapeutic Sciences. Subsequent commitment to the process by the head of the DOT and the head of the School of Therapeutic Sciences ensured the active sourcing of funding to support two dedicated staff positions, as well as upgrading of facilities to support BL. The commitment of the lecturers to the process ensured their openness to being trained on use of the e-learning tools, and through instituting regular curriculum meetings for all lecturers, the pedagogy of the BL within PBL was regularly discussed. The decision that all PBL modules from first to fourth year would hold an online component and that all announcements and notices would be done via the news forum rather than the physical paper notice board drove the students to their class VLE on a regular basis through fear of missing announcements. Student buy-in was rapid as they saw the benefit of all having access to the same information. This drove the cycle whereby students started requesting that certain content be posted to the VLE, which further encouraged lecturer buy-in.

The goodness of fit element may not always be present and is often a barrier to integration of BL when the person supporting the process is a poor fit to the context of the curriculum. The fact that I was an occupational therapist who had lectured in the DOT was an advantage as I was an ‘insider’. The lecturers trusted my understanding of the occupational therapy curriculum, and during training and support sessions I was able to provide contextual occupational therapy examples to illustrate BL concepts and learning activities. This is possibly one unique factor to this research, as instructional designers or educational technologists typically are trained to support BL across the professions, and typically have an education background rather than a profession-specific background[148]. It is thus valuable for those supporting the lecturers in their BL journey who are not from the profession to take time to understand the curriculum, spend time with the lecturers while they teach, and build the relationship through showing authentic interest in their curriculum. Goodness of fit can be developed by active involvement in the curriculum in order to shift from being perceived as an ‘outsider’ towards an ‘insider’ presence.

Buy-in was achieved through collaborative decision making and commitment from all stakeholders. If goodness of fit is not initially present this should be a focus to ensure that buy-in is retained over time, and the relevance of the BL activities remains at the forefront.

#### *7.5.1.2. Being evidence-based*

Siemens[98] proposed connectivism as a learning theory for the 21st century, which formed the foundation theory for integrating BL into the undergraduate occupational therapy curriculum. I actively engaged with the literature throughout the research process, attended two international education conferences, and presented annually at local health science education conferences and occupational therapy conferences. I was awarded the SAFRI fellowship in 2011 which grounded my understanding of health sciences education within the Sub-Saharan Africa context, adding to the knowledge that I brought to the PAR. The rapid technological developments throughout the six years of the study required active vigilance to the opportunities and challenges that rapid development brings. It is vital in integrating BL into a similar PBL curriculum that keen attention is focused on understanding the learning theory that is adopted and in being evidence-based.

#### *7.5.1.3. Just do it!*

Naysayers find reasons why BL will not work for them and thus for the whole community. If a naysayer is given the power to hinder the process through fear that some aspect will not succeed, then the integration of BL will not succeed. Many concerns and suggested obstacles were raised in the early phases of the PAR. Through the motto of 'just do it!' I made decisions that were time sensitive such as the decision to use a local version of Moodle as the VLE rather than hold out for a stable WITS VLE (refer 1.9.1 p. 44). The lecturers were encouraged to try new learning activities – to 'just do it!', with my support and with an alternate learning activity at the ready should something go wrong. Confidence grew with each successful learning activity. As one lecturer succeeded the ripple effect took over, giving other lecturers the confidence to 'just do it'. On the whole the successes far out-weighed the failures. When an activity didn't work, such as the server not initially coping with simultaneous access of the whole class for an online class-test, a paper-based version was available in the one instance and in another the students were given staggered start times. Through being available and helping the lecturer adapt as an issue emerged, the confidence to 'just do it!' grew.

It is important to not let the naysayers become a barrier to initiating BL into a PBL curriculum, and without engaging in any activity it is impossible for them to learn how to accommodate the issues that do arise. The stakeholders of the PAR all learnt to adapt and improve their BL engagement through initially 'just doing it!'.

### 7.5.1.4. Support

Having the support of the head of the School of Therapeutic Sciences and being afforded the budget to hire a graphic designer contributed to improving the technology support available to the lecturers of the DOT. Being available to the lecturers of the DOT for training and individual support (such as with Paper 3 and 4) and as highlighted in Paper 5, provided lecturers with a sense of security to try new BL activities and engage with the curriculum in innovative ways. In many other contexts the e-learning support, instructional design team and educational technologists are housed centrally within an institution. In fact at WITS the eLearning Support and Innovation team[197] is housed on the main university campus, comprising of four to six instructional designers to support all five faculties incorporating 33 schools and more than 3000 courses. In contrast, we started as a team of two, myself and a graphic designer, and grew to a team of four (myself, the graphic designer, an instructional designer and a technician) to initially support the DOT and, over the six-year period, incorporating the four other departments within the School of Therapeutic Sciences, hosting 48 VLE courses. We are housed in proximity to all the departments, and are thus able to provide support at a moment's notice.

The availability of support to lecturers was a definite driver of change as we became embedded in the DOT and were considered an integral part of the teaching team. Support has to be easily accessed at the time of need to be perceived as giving a sense of security for lecturers to try new ways of using the technology, which central units such as the WITS eLearning Support and Innovation unit are unable to provide to non-central campuses. For successful integration of BL, the support team should be available to ensure the lecturers develop the confidence and skills to do it themselves. Initial hand-holding is soon overtaken by peer-to-peer lecturer support and internal transfer of skills.

### 7.5.1.5. Students are primed for Blended Learning

Paper 2 provided evidence that students are primed for BL in that the majority of first-year occupational therapy students rated their digital media proficiency at a mode of 8 on the 10-point scale, 68.5% had a personal computer/laptop and 70.5% had off-campus internet access at the start of their degree. This was supported in the qualitative evidence presented in paper 5 indicating that students are starting to develop their personal learning environments and networks outside of the VLE. While 'digital apartheid' remains a concern, we have noted a 'catch-up' effect of the skills dimension within the first year of study, dispelling the concerns that students do not have the digital skills to cope with the academic demands of the degree. However, the virtual and material dimensions remain a concern.

Students are primed for BL, most of them are of the net-generation, and the iFacebook generation will soon enter higher education[88,125]. Awareness of the impact of 'digital

apartheid' should not be lost, but rather accommodated and the process of integrating BL into similar PBL curricula should continue, with the confidence that the students are primed for BL.

#### *7.5.1.6. Hurdles to Blended Learning*

This research has been supported by extensive grant funding from the Department of Higher Education and Training. This funding is awarded in two-year tranches which require reporting on the use of the funds and the outcomes, with reapplication for each new tranche. These funds are thus not guaranteed and the allocation varies with each tranche. Of concern is the fairly static nature of the staffing portion of the grant, which limits annual salary increases, staff promotion and expansion of staffing to cope with massification. While the affordances offered by this grant have been substantial in contributing to the success of this research, the potential that the funds may decrease or be removed would place a considerable hurdle to the continued development and innovation of BL within the occupational therapy curriculum. Third-stream income in the form of online continued professional development courses is being initiated, but is unlikely to fully support the staffing, operational and equipment budget of the e-learning team. Our approach is to skill the lecturers to become independent, but developments in the field of BL would possibly be left unexploited as the lecturer focus is on profession-specific rather than educational developments. Funding streams for sustainability should be carefully considered in similar contexts when integrating BL into a PBL curriculum.

Paper 1 presented the limited capacity of the server hosting Moodle as an early hurdle impacting the integration of BL into the undergraduate occupational therapy degree. Paper 5 revisited various hurdles, noting that while they were a barrier, the upgrade of the Moodle software versions and migration to a server with larger capacity had mitigated much of the concerns regarding simultaneous access during online examinations. Most of the PBL end-of-module knowledge assessments are now in the form of online class tests hosted on Moodle, without the need to stagger the start or have paper-based versions available. Lecturers now trust the system.

Paper 1 and 5 presented the instability of the WITS network infrastructure, fluctuating Wi-Fi connectivity, and the local power infrastructure that are unpredictable hurdles which create a degree of frustration when online activities are disrupted. The drive towards mLearning as presented in paper 4 presents a strategy for combatting the power outages, but as noted in the paper, the cost of mobile data in South Africa is among the most expensive on the African continent. Stable bandwidth is thus a vital consideration in implementing BL in a similar context. At WITS the network infrastructure is currently in the process of being upgraded, but as an 18-month project the new infrastructure will not reach the DOT within the current academic year.

#### 7.5.1.7. Conclusion to the drivers of change

This section presented six drivers of change that emerged from the qualitative analysis of the data collected over the research period and supported in all the papers presented in this thesis. These form the key considerations for similar initiatives to better predict the successful integration of BL into a similar PBL curriculum.

### 7.5.2. Outcomes of Blended Learning

This research constituted a long-term investigation into the integration of BL into the undergraduate occupational therapy curriculum. Unlike many short-term studies into the outcomes of BL this thesis benefits from the effect of habituation, familiarity, skills development, experiencing success as a motivator, and the sense that 'there is no going back,' as suggested in the conclusion to paper 5. Students currently enrolled in the occupational therapy courses are unaware that BL is a relatively new component to the PBL curriculum delivery in the DOT. They have come to expect online learning resources, self-evaluation and formative learning opportunities and the open lines of communication that the VLE facilitates.

#### 7.5.2.1. Success

The five papers of this thesis present the success of integrating BL into the undergraduate occupational therapy curriculum as summarised in 7.2 to 7.4. The DOT has fully adopted BL as an integral part of the way teaching and learning are done. It is now deemed to be normal! While innovation is a continual process, the success drives continual engagement and participation in developing the BL approach to teaching and learning within the DOT.

As presented in paper 5, the increase in research publication output of the DOT during the course of the research can be viewed as an outcome of integrating BL into the curriculum. The lecturers' digital literacy skills have improved and their confidence in using software that supports academic writing is an indirect consequence of their BL content creation and engagement with technology. The element of time saving was suggested as affording lecturers the opportunity to conduct research, which is a key performance area for all academics, as well as to increase their capacity for supervision of postgraduate students.

#### 7.5.2.2. Student related outcomes

Paper 5 presented qualitative outcomes of the integration of BL which supported the students learning and participation in the courses. Communication between the lecturers and between lecturers and students improved as email chains and text-message communication trees gave way to the news forum. Students feel reassured that they have the same information as their peers, they have easy access to their marks which allows them to gauge

their potential for succeeding in the course or initiates early intervention for the at-risk student. One of the concerns with PBL is that students may have different responses to the learning outcomes and inconsistent information between groups[139,145]. Students and lecturers perceived greater transparency of the curriculum through collaboration on the VLE and sharing of PBL wiki pages between groups. Students have a sense of instant gratification in that marks from online class-tests are released soon after the test is written, and the turnaround time for feedback on their clinical performance has improved through the electronic rubrics used by the lecturers. Instant gratification was also suggested as a frustration at times when students expected online resources to be available or information to be released in a timeframe that lecturers were unaware of or unable to meet. The expectation of instant gratification should be managed through communication.

#### *7.5.2.3. Valued as a game-changing project*

The integration of BL into the undergraduate occupational therapy curriculum was recognised by WITS as a game-changing project in 2010 when the team was awarded the Vice Chancellors Team teaching award for the impact within the DOT. As presented in paper 5, the other departments in the School of Therapeutic Sciences have requested support and adopted a similar process of integrating BL into their curricula. In 2017 the project was again awarded the Vice Chancellors Teaching and Learning Award in the Team category, this time for the impact on teaching and learning across the whole School of Therapeutic Sciences.

#### *7.5.2.4. Conclusion of the outcomes of Blended Learning*

The five papers presented in this thesis present both the positive outcomes and the ongoing concerns that have emerged. The influence of the integration of BL into the undergraduate occupational therapy curriculum is evident in the success in terms of student and lecturer participation, student and lecturer attitudes towards BL, and the effect that BL has had on student performance (paper 3) and their perceived knowledge gain (paper 4). Lecturers are proficient in creating their own content, and continue investigating new opportunities that BL may bring to their PBL modules. Paper 5 presents a detailed account of the outcomes of BL in the context of the WITS DOT, suggesting that the drivers of change have been effective in integrating BL into the undergraduate occupational therapy curriculum.

## 7.6. Conclusion

The five papers presented in this thesis provide evidence that the PAR that integrated BL into the undergraduate occupational therapy curriculum positively influenced the teaching and learning activities of the DOT. The drivers of change provide others in similar educational contexts engaging in PBL with six strategic aspects to guide the process of

initiating BL integration. While there are hurdles to overcome in any context, by ensuring that there is buy-in from all stakeholders and a goodness of fit between the stakeholder groups, remaining evidence based, having as-needed support, and recognising that students are primed for BL, the stage is set to 'just do it!"

## 7.7. Limitations

The limitations of the research contributing to the papers presented in this thesis are presented within each paper. While there is evidence of elements of 'digital apartheid' contributing to the student and lecturer stakeholders' engagement with BL, the thesis did not deal in-depth with the state of 'digital apartheid' present across all three dimensions.

## 7.8. The way forward

Blended Learning is embedded in the day-to-day curriculum delivery within the DOT and technology is now viewed as an enabler to support the curriculum. 'Digital apartheid', disappointing throughput rates and massification continue to loom over the DOT, with no indication that staff or infrastructure resources will increase.

Recently the unavailability of clinical placements for the increasing number of students is concerning, placing the requirement to achieve the >1000 hours of clinical fieldwork under threat. Students are being sent to fieldwork sites that are further away from WITS, which influences the ability of the lecturers to regularly conduct fieldwork supervision visits. The affordances of mobile technology and collaboration with clinical sites for broadband access is being negotiated to allow lecturers to do virtual site visits using video conferencing applications.

Fixed desk computing environments have proved limiting when considering the collaborative nature of the 21CLD, particularly when considering the BL nature of PBL within the occupational therapy curriculum. The development of a flexible, adaptable, mobile technology-rich learning spaces allows the DOT to transition into integration of physical spaces with the F2F and online elements in the next level of blending. The recent addition of such a space, the eZone, within the School of Therapeutic Sciences is a first within WITS and other universities in South Africa. This is a teaching space as opposed to a library style space[198] and was recently showcased in the WITS research magazine, Curiosity[199].

As technology shapes the world we live in and the fourth industrial revolution redesigns the world of work, pedagogy should not just keep up but should leap ahead of the innovation curve if we wish to prepare students to adapt to their ever-changing careers.

### 7.8.1. Further research

When learning spaces are considered, further research will focus on incorporating technology into learning space and will aim to understand the role of teaching and learning spaces in blended learning. The following investigations will be conducted:

1. A quantitative investigation of the booking logs, records of the learning activities, the devices used and profiles of students participating in these learning activities.

2. A qualitative investigation through key informant interviews will document the lecturer and student experiences.

'Digital apartheid' has emerged as a multi-dimensional construct which influences students and lecturers to varying degrees. Understanding the scope and impact of 'digital apartheid' on health sciences education needs to be explored as an extension of this thesis. Should evidence emerge that students and lecturers experience oppression through 'digital apartheid', then the potential of BL and 21CLD as emancipatory strategies may be explored to address such identified inequality.

# Chapter 8. Reference List for Chapter 1 and 7


1. Council on Higher Education (CHE). South African Higher Education Reviewed: Two Decades of Democracy. Pretoria: Council on Higher Education, 2016.
2. Mdepa W, Tshiwula L. Student Diversity in South African Higher Education. Widening Participation & Lifelong Learning, 2012; 13: 19-33.
3. Department of Education. White Paper on E-Education: Transforming Learning and Teaching through Information and Communication Technologies (Icts). Government Gazette: Republic of South Africa, 2004; 470(26734): 1-43.
4. Cloete N. The South African Higher Education System: Performance and Policy. Studies in Higher Education, 2014; 39(8): 1355-1368.
5. Department of Education. Education White Paper 3: A Programme for the Transformation of Higher Education. In: Department of Education, editor. Pretoria: Department of Education,; 1997. p. 55.
6. Alexander M. "Nelson Mandela Dies: Man Who Reinvented South Africa as a 'Rainbow Nation'". The Conversation Africa, Inc. 2013. <https://theconversation.com/nelson-mandela-dies-man-who-reinvented-south-africa-as-a-rainbow-nation-15594> [Accessed 21 March 2018]
7. National Commission on Higher Education (NCHE). A Framework for Transformation. Cape Town: National Commission on Higher Education, 1996 RP124/1996.
8. Council on Higher Education. Review of Higher Education in South Africa: Selected Themes. Pretoria: Council on Higher Education, 2007.
9. Bozalek V, Boughey C. (Mis)Framing Higher Education in South Africa. Social Policy & Administration, 2012; 46(6): 688-703.
10. Government of South Africa. Act 101 of 1997: The Higher Education Act. Government Gazette, 1997; 360(18515): 46.
11. Ministry of Education. Higher Education Restructuring and Transformation: Guidelines for Mergers and Incorporations. Pretoria: Ministry of Education, 2003.
12. Ministry of Education. National Plan for Higher Education in South Africa. Pretoria: Ministry of Education, 2001.
13. "Council on Higher Education (Che) South Africa". 2018. <http://www.che.ac.za/> [Accessed 09 January 2018]
14. King R. Globalisation and Higher Education. Milton Keynes: Centre for Higher Education Research and Information (CHERI), 2011.
15. Maringe F, Foskett N. Globalization and Internationalization in Higher Education: Theoretical, Strategic and Management Perspectives. London: Bloomsbury T&T Clark, 2010.
16. Adams F. Managerialism and Higher Education Governance : Implications for South African Universities? South African Journal of Higher Education, 2006; 20(1): 5-16.
17. Dzvimbo KP, Moloi KC. Globalisation and the Internationalisation of Higher Education in Sub-Saharan Africa. South African Journal of Education, 2013; 33(3): 1-16.
18. Department of Finance. Growth, Employment and Redistribution: A Macroeconomic Strategy. Pretoria: Department of Finance,; 2005.
19. National Planning Commission. National Development Plan 2030: Our Future-Make It Work. The Presidency Republic of South Africa, 2012.
20. Doiz A, Lasagabaster D, Sierra J. Globalisation, Internationalisation, Multilingualism and Linguistic Strains in Higher Education. Studies in Higher Education, 2013; 38(9): 1407-1421.
21. Department of Higher Education and Training. Draft Policy Framework for the Provision of Distance Education in South African Universities. Pretoria: Department of Higher Education and Training; 2012. p. 1-33.
22. Council on Higher Education (CHE). Language Policy Framework for South African Higher Education. Pretoria: Council on Higher Education,, 2001.

23. Bagilhole B. A Cross-National Analysis of Gender Equality and the Shift from Collegiality to Managerialism in Higher Education Policy. Acta Paedagogica Vilnesia, 2012; 28: 23-36.
24. Johnston K. A Guide to Educating Different Generations in South Africa. Issues in Informing Science & Information Technology, 2013; 10: 261-273.
25. Davis A, Jansen van Rensburg M, Venter P. The Impact of Managerialism on the Strategy Work of University Middle Managers. Studies in Higher Education, 2016; 41(8): 1480-1494.
26. Council on Higher Education (CHE). Access and Throughput in South African Higher Education: Three Case Studies. Pretoria: Council on Higher Education, 2010.
27. Kholeka C, Malegapuru WM, Collins Ogutu M. (De)Constructing the #Feesmustfall Campaign in South African Higher Education. Contemporary Education Dialogue, 2017; 14(2): 211-223.
28. Tight M. Collegiality and Managerialism: A False Dichotomy? Evidence from the Higher Education Literature. Tertiary Education and Management, 2014; 20(4): 294-306.
29. Hornsby DJ, Osman R. Massification in Higher Education: Large Classes and Student Learning. Higher Education, 2014; 67(6): 711-719.
30. Portnoi L. Cultivating the Next Generation of Academics in South Africa. Africa Education Review, 2009; 6(2): 187-207.
31. Snowball J, Mostert M. Introducing a Learning Management System in a Large First Year Class: Impact on Lecturers and Students. South African Journal of Higher Education, 2010; 24(5): 818-831.
32. Steyn R, Vosloo R. Maximizing Research Success through Integrated Research Project Supervision. International Journal of Science in Society, 2014; 5(1): 43-52.
33. Moeketsi RMH, Mgutshini T. A Comparative Time Review of Recruitment and Retention at a University in South Africa. African Journal for Physical, Health Education, Recreation & Dance, 2014; 20(1): 246-264.
34. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2015. Pretoria: Department of Higher Education and Training, 2017.
35. Council on Higher Education (CHE). Vitalstats: Public Higer Education 2015. Pretoria: Council on Higher Education, 2017.
36. Health Professions Council of South Africa. "Professional Boards: Occupational Therapy, Medical Orthotics, Prosthetics and Arts Therapy". 2018. <http://www.hpcsa.co.za/PBOccupational/Education> [Accessed 13 February 2018]
37. Council on Higher Education (CHE). The State of Higher Education in South Africa. Pretoria: Council on Higher Education, 2009.
38. Times Higher Education. "The Times Higher Education World University Rankings 2018". Times HIgher Education. 2018. <https://www.timeshighereducation.com/world-university-rankings/2018/world-ranking#!/page/0/length/25/sort_by/rank/sort_order/asc/cols/scores> [Accessed 09 February 2018]
39. Ministry of Education. Policy and Procedures for Measurement of Research Output of Public Higher Education Institutions Pretoria: Department of Education 2003.
40. Council on Higher Education (CHE). Vitalstats: Public Higher Education 2012. Pretoria: Council on Higher Education, 2014.
41. Department of Higher Education and Training. List of Occupations in High Demand: 2015. Government Gazette, 2016; 34(39604): 1-13.
42. de Kadt E. The Challenges of Undergraduate Education: Looking Back and Ahead. Focus: The Journal of the Helen Suzman Foundation, 2015; 76: 38-43.
43. National Research Foundation. "National Research Foundation Rating". National Research Foundation. 2018. <http://www.nrf.ac.za/rating> [Accessed 02 February 2018]
44. Council on Higher Education (CHE). Vitalstats: Public Higher Education 2010. Pretoria: Council on Higher Education, 2012.

45. ShanghaiRanking Consultancy. "Academic Ranking of World Universities (Arwu)". ShanghaiRanking Consultancy. 2017. <http://www.shanghairanking.com/ARWU2017.html> [Accessed 17 February 2018]
46. United Nations Educational SaCOU. "Education: Gross Enrolment Ratio by Level of Education". UNESCO Institute for Statistics 2015. <http://data.uis.unesco.org/index.aspx?queryid=142#> [Accessed 17 February 2018]
47. The World Bank. "Gross Enrolment Ratio, Tertiary, Both Sexes (%)". World Bank Group. 2014. <https://data.worldbank.org/indicator/SE.TER.ENRR?end=2016&start=2014&year_low_desc=false> [Accessed 17 February 2018]
48. The World Bank. "The World Bank Data: South Africa". World Bank Group. 2018. <https://data.worldbank.org/country/south-africa?view=chart> [Accessed 09 February 2018]
49. Shrivastava M, Shrivastava S. Political Economy of Higher Education: Comparing South Africa to Trends in the World. Higher Education (00181560), 2014; 67(6): 809-822.
50. Foley A, Masingila J. Building Capacity: Challenges and Opportunities in Large Class Pedagogy (Lcp) in Sub-Saharan Africa. Higher Education (00181560), 2014; 67(6): 797-808.
51. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2010. Pretoria: Department of Higher Education and Training, 2012.
52. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2011. Pretoria: Department of Higher Education and Training, 2013.
53. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2012. Pretoria: Department of Higher Education and Training, 2014.
54. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2013. Pretoria: Department of Higher Education and Training, 2015.
55. Department of Higher Education and Training. Statistics on Post-School Education and Training in South Africa: 2014. Pretoria: Department of Higher Education and Training, 2016.
56. Habib A. Accelerating Transformation for an Inclusive and Competitive Wits. Focus: The Journal of the Helen Suzman Foundation, 2015; 76: 8-14.
57. Senior Executive Team. "Transorfmation Update". University of the Witwatersrand. 2017. <https://www.wits.ac.za/news/latest-news/general-news/2017/2017-11/transformation-update.html> [Accessed 24 February 2018]
58. Queiros DR, de Villiers MR. Online Learning in a South African Higher Education Institution: Determining the Right Connections for the Student. International Review of Research in Open and Distributed Learning, 2016; 17(5): 166-185.
59. Powell CL. Is the Digital Divide a Problem or an Opportunity? Businessweek. 2000 18 December:20.
60. Brown C, Czerniewicz L. Debunking the "Digital Native": Beyond Digital Apartheid, Towards Digital Democracy. Journal of Computer Assisted Learning, 2010; 26(5): 357-369.
61. Czerniewicz L, Brown C. The Habitus of Digital 'Strangers' in Higher Education. British Journal of Educational Technology, 2013; 44(1): 44-53.
62. Graham M. Time Machines and Virtual Portals. Progress in Development Studies, 2011; 11(3): 211-227.
63. Kajee L, Balfour R. Students' Access to Digital Literacy at a South African University: Privilege and Marginalisation. Southern African Linguistics & Applied Language Studies, 2011; 29(2): 187-196.
64. Oyedemi TD. Digital Inequalities and Implications for Social Inequalities: A Study of Internet Penetration Amongst University Students in South Africa. Telematics and Informatics, 2012; 29(3): 302-313.

65. Cornish S. "Is Digital Redlining Causing Internet Caste System?". The Afro-American Newspapers. 2015. <http://www.afro.com/is-digital-redlining-causing-internet-caste-system/> [Accessed 1 April 2018]
66. Naidoo S, Raju J. Impact of the Digital Divide on Information Literacy Training in a Higher Education Context. South African Journal of Libraries & Information Science, 2012; 78(1): 34.
67. Gilliard C. Privacy Blog: Digital Redlining, Access, and Privacy. In: Common sense education. [Online] Available from: <https://www.commonsense.org/education/privacy/blog/digital-redlining-access-privacy> [Accessed 1 April 2018]
68. Pritchard GW, Vines J, editors. Digital Apartheid: An Ethnographic Account of Racialised Hci in Cape Town Hip-Hop. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems; 2013: ACM.
69. ShowMe. "Showme Soweto". ShowMe™ Community Websites. 2018. <https://showme.co.za/soweto/about-soweto/> [Accessed 10 February 2018]
70. Statistics South Africa. Community Survey 2016: Statistical Release. Pretoria: Statistics South Africa, 2016 P0301.
71. Department of Basic Education. Neims: National Education Infrastructure Management System Standard Report. Pretoria: Department of Basic Education,, 2015.
72. De Lanerolle I. The Future Is Already Here, It's Just Not Very Evenly Distributed...: Journalism Next. Rhodes Journalism Review, 2015; (35): 6-11.
73. The Broadband Commission for Digital Development. The State of Broadband 2015: Broadband as a Foundation for Sustainable Development. Geneva: the International Telecommunication Union (ITU) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) 2015.
74. Khalid MS, Pedersen MJL. Digital Exclusion in Higher Education Contexts: A Systematic Literature Review. Procedia - Social and Behavioral Sciences, 2016; 228(Supplement C): 614-621.
75. Goldstuck A. Internet Access in South Africa 2017: Executive Summary. Randburg: World Wide Worx, 2017.
76. Chair C. "Update: State of Prepaid Market in South Africa Submission to the Parliament of South Africa on “the Cost to Communicate in South Africa”". Research ICT Africa. 2016. <http://researchictafrica.net/publications/Other_publications/2016_South%20Africa_Cost%20to%20Communicate%20Submission_RIA%20.pdf> [Accessed 28 September 2016]
77. Vumatel. "Vumatel Coverage Map: Johanneburg". 2018. <https://vumatel.co.za/coverage> [Accessed 30 March 2018]
78. Vumatel. "Vuma Faq: How Does Vuma Decide Which Suburbs to Roll out into First?". 2018. <https://vumatel.zendesk.com/hc/en-us/articles/207785909-How-does-VUMA-decide-which-suburbs-to-roll-out-into-first-> [Accessed 30 March 2018]
79. Calandro E, Stork C, Gillwald A. Research Ict Africa Policy Brief No. 2: Internet Going Mobile - Internet Access and Usage in 11 African Countries. Cape Town: 2012.
80. Papageorgiou E, Callaghan C. Resource Scarcity and Information Technology: Issues and Trends among First-Year Accounting Students. South African Journal of Higher Education, 2014; 28(5): 1575-1592.
81. Council on Higher Education (CHE). Distance Higher Education Programmes in a Digital Era: Good Practice Guide. Pretoria: Council on Higher Education, 2014.
82. Franklin TJ. Embracing the Future: Empowering the 21st Century Educator. Procedia - Social and Behavioral Sciences, 2015; 176: 1089-1096.
83. Ng'ambi D, Brown C, Bozalek V, Gachago D, Wood D. Technology Enhanced Teaching and Learning in South African Higher Education - a Rearview of a 20 Year Journey. British Journal of Educational Technology, 2016; 47(5): 843-858.
84. Naidoo U, Flack PS, Naidoo I, Essack SY. Secondary School Factors Relating to Academic Success in First Year Health Science Students. South African Journal of Higher Education, 2014; 28(4): 1332-1343.

85. Kivunja C. Do You Want Your Students to Be Job-Ready with 21st Century Skills? Change Pedagogies: A Pedagogical Paradigm Shift from Vygotskyian Social Constructivism to Critical Thinking, Problem Solving and Siemens' Digital Connectivism. International Journal of Higher Education, 2014; 3(3): 81-91.
86. Oberprieler G, Masters K, Gibbs T. Information Technology and Information Literacy for First Year Health Sciences Students in South Africa: Matching Early and Professional Needs. Medical Teacher, 2005; 27(7): 595-598.
87. Wessels PL, Steenkamp LP. Generation Y Students: Appropriate Learning Styles and Teaching Approaches in the Economic and Management Sciences Faculty. South African Journal of Higher Education, 2009; 23(5): 1039-1058.
88. Codrington GT, Grant-Marshall S. Mind the Gap: Own Your Past Know Your Generation Choose Your Future. Johannesburg: Penguin, 2011.
89. Viljoen C, Deacon E. Factors Influencing First-Year Students' Intention to Stay on at an Educational Institution. South African Journal of Higher Education, 2013; 27(1): 239-262.
90. Dunaway MK. Connectivism. Reference Services Review, 2011; 39(4): 675-685.
91. McCann P. Global Village or Global City? The (Urban) Communications Revolution and Education. Paedagogica Historica, 2003; 39(1/2): 165.
92. Sebolai K. Validating a Test of Academic Literacy at a South African University of Technology. Die geldigheid van 'n toets vir akademiese geletterdheid by 'n Suid-Afrikaanse universiteit van tegnologie, 2013; 45(3): 215-241.
93. Büttcher S, Clarke CL, Cormack GV. Information Retrieval: Implementing and Evaluating Search Engines: Mit Press, 2016.
94. The American Occupational Therapy Association. Occupational Therapy Practice Framework: Domain & Process 3rd Edition. American Journal of Occupational Therapy, 2014; 68(Suppl. 1): S1-S48.
95. Robinson K. Out of Our Minds: The Power of Being Creative. 3rd ed. West Sussex: Wiley, 2017.
96. Light R. Complex Learning Theory--Its Epistemology and Its Assumptions About Learning: Implications for Physical Education. Journal of Teaching in Physical Education, 2008; 27(1): 21-37.
97. Anderson T, Dron J. Learning Technology through Three Generations of Technology Enhanced Distance Education Pedagogy. European Journal of Open, Distance and E-Learning, 2012; (2).
98. Siemens G. Connectivism: A Learning Theory for the Digital Age. International Journal of Instructional Technology and Distance Learning, 2005; 2(1): 3-10.
99. Powell KC, Kalina CJ. Cognitive and Social Constructivism: Developing Tools for an Effective Classroom. Education, 2009; 130(2): 241-250.
100. Von Glaserfeld E. Learning and Adaptation in the Theory of Constructivism. Communication and Cognition, 1993; 26(3): 393-402.
101. Peterson TE. Constructivist Pedagogy and Symbolism: Vico, Cassirer, Piaget, Bateson. Educational Philosophy & Theory, 2012; 44(8): 878-891.
102. von Glaserfeld E. An Exposition of Constructivism: Why Some Like It Radical In: Davis RB, Maher CA, Noddings N, editors. Constructivist Views on the Teaching and Learning of Mathematics Journal for Research in Mathematics Education: Monograph No 4. Reston, VA: National Council of Teachers of Mathematics; 1990. p. 19-29.
103. Riegler A, Steffe LP. "What Is the Teacher Trying to Teach Students If They Are All Busy Constructing Their Own Private Worlds?". Constructivist Foundations, 2014; 9(3): 297-301.
104. Le Moigne J-L. From Jean Piaget to Ernst Von Glasersfeld: An Epistemological Itinerary in Review. Constructivist Foundations, 2011; 6(2): 152-156.
105. Müller KH. The Two Epistemologies of Ernst Von Glasersfeld. Constructivist Foundations, 2011; 6(2): 220-226.
106. Riegler A. What Does the Future Hold for Radical Constructivism? Studies in Meaning, 2015; 5: 64-86.
107. Goldin GA. Epistemology, Constructivism, and Discovery Learning in Mathematics. In: Davis RB, Maher CA, Noddings N, editors. Journal for Research in Mathematics

Education Monograph: National Council of Teachers of Mathematics; 1990. p. 31-210.
108. Siemens G. Knowing Knowledge: Lulu. com, 2006.
109. Dewey J. How We Think. Boston: D.C. Heath & Co., 1910.
110. Dewey J. Democracy and Education: An Introduction to the Philosophy of Education (Unabridged Replication - 2004). New York: Dover Publications, 1916.
111. Boytchev P. Constructionism and Deconstructionism. Constructivist Foundations: An Interdisciplinary Journal, 2015; 10(3): 355-363.
112. Chang C-S, Chen T-S, Hsu W-H. The Study on Integrating Webquest with Mobile Learning for Environmental Education. Computers & Education, 2011; 57(1): 1228-1239.
113. Giaimo-Ballard C, Hyatt L. Reflection-in-Action Teaching Strategies Used by Faculty to Enhance Teaching and Learning. Networks: An Online Journal for Teacher Research, 2012; 14(2): 1-11.
114. Tuli F. The Basis of Distinction between Qualitative and Quantitative Research in Social Science: Reflection on Ontological, Epistemological and Methodological Perspectives. Ethiopian Journal of Education and Sciences, 2011; 6(1).
115. Mentis M. Navigating the E-Learning Terrain: Aligning Technology, Pedagogy and Context. Electronic Journal of e-Learning, 2008; 6(3): 217-226.
116. Siemens G. "Connectivism: Learning Theory or Pastime of the Self-Amused?". Learning Technologies Centre. 2006. <http://www.elearnspace.org/Articles/index.htm> [Accessed 15 June 2016]
117. Kop R, Hill A. Connectivism: Learning Theory of the Future or Vestige of the Past? International Review of Research in Open and Distance Learning, 2008; 9(3): 1-13.
118. Dunn W, Brown C, McGuigan A. The Ecology of Human Performance: A Framework for Considering the Effect of Context. The American Journal of Occupational Therapy, 1994; 48(7): 595-607.
119. Durairaj K, Umar IN. A Proposed Conceptual Framework in Measuring Social Interaction and Knowledge Construction Level in Asynchronous Forum among University Students. Procedia - Social and Behavioral Sciences, 2015; 176: 451-457.
120. Boitshwarelo B. Proposing an Integrated Research Framework for Connectivism: Utilising Theoretical Synergies. International Review of Research in Open and Distance Learning, 2011; 12(3): 161-179.
121. March T. The Learning Power of Webquests. Educational Leadership, 2003; 61(4): 42-47.
122. Rifkin J. The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy, and the World: St. Martin's Press, 2011.
123. Blinder AS. Education for the Third Industrial Revolution. Princeton: Center for Economic Policy Studies, 2008 Working Paper No. 163.
124. Vale R. "The Four Industrial Rovolutions in an Glimpse". Richmond Vale Academy. 2016. <http://richmondvale.org/industrial-revolutions/> [Accessed 3 April 2018]
125. Bush N, Codrington G. Future-Proof Your Child: Parenting the Wired Generation: Penguin Books Limited, 2012.
126. Tuomi I. Learning in the Age of Networked Intelligence. European Journal of Education, 2007; 42(2): 235-254.
127. Schwab K. "The Fourth Industrial Revolution". Foreign Affairs. 2015. <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution> [Accessed 4 April 2018]
128. Downes S. Connectivism and Connective Knowledge: Essays on Meaning and Learning Networks. Canada: Stephen Downes, 2012.
129. Kennedy AS, Heineke A. Re-Envisioning the Role of Universities in Early Childhood Teacher Education: Community Partnerships for 21st-Century Learning. Journal of Early Childhood Teacher Education, 2014; 35(3): 226-243.
130. Al-Arfaj MM. Undergraduate Learning Outcomes for the 21st Century and Associated Practices: The Case of the College of Education at King Faisal University. Ontario Action Researcher, 2011; 11(2): 1-11.

131. Irvine V, Code J, Richards L. Realigning Higher Education for the 21st-Century Learner through Multi-Access Learning. Journal of Online Learning & Teaching, 2013; 9(2): 172-186.
132. O'Connor E, McDonald F, Ruggiero M. Scaffolding Complex Learning: Integrating 21st Century Thinking, Emerging Technologies, and Dynamic Design and Assessment to Expand Learning and Communication Opportunities. Journal of Educational Technology Systems, 2014; 43(2): 199-226.
133. Armatas C, Vincent A. Leveraging the Collaborative and Interactive Potential of 21st Century Learning Spaces: Victoria University's Student Business Innovation and Incubation Space. International Journal of Learning, 2011; 18(2): 133-142.
134. Barrows HS. A Taxonomy of Problem-Based Learning Methods. Medical Education, 1986; 20(6): 481-486.
135. Wijnen M, Loyens SMM, Schaap L. Experimental Evidence of the Relative Effectiveness of Problem-Based Learning for Knowledge Acquisition and Retention. Interactive Learning Environments, 2015: 1-15.
136. Ilic D, Hart W, Fiddes P, Misso M, Villanueva E. Adopting a Blended Learning Approach to Teaching Evidence Based Medicine: A Mixed Methods Study. BMC Medical Education, 2013; 13: 169.
137. McCannon R, Robertson D, Caldwell J, Juwah C, Elfessi A. Students' Perceptions of Their Acquired Knowledge During a Problem Based Learning Case Study. Occupational Therapy in Health Care, 2004; 18(4): 13-28.
138. Jacobs L. The Other Side of the Coin: Ot Students' Perceptions of Problem-Based Learning. South African Journal of Occupational Therapy, 2014; 44(1): 62-67.
139. Woltering V, Herrler A, Spitzer K, Spreckelsen C. Blended Learning Positively Affects Students' Satisfaction and the Role of the Tutor in the Problem-Based Learning Process: Results of a Mixed-Method Evaluation. Advances in Health Sciences Education, 2009; 14(5): 725-738.
140. Liotta-Kleinfeld L, McPhee S. Comparison of Final Exam Test Scores of Neuroscience Students Who Experienced Traditional Methodologies Versus Problem-Based Learning Methodologies. Occupational Therapy in Health Care, 2001; 14(3/4): 35-53.
141. Herzig S, Linke R-M, Marxen B, Börner U, Antepohl W. Long-Term Follow up of Factual Knowledge after a Single, Randomised Problem-Based Learning Course. BMC Medical Education, 2003; 3(1): 3.
142. O'Donoghue G, McMahon S, Doody C, Smith K, Cusack T. Problem-Based Learning in Professional Entry-Level Therapy Education: A Review of Controlled Evaluation Studies. Interdisciplinary Journal of Problem-based Learning, 2011; 5(1): 54-73.
143. Zhou J, Zhou S, Huang C, Xu R, Zhang Z, Zeng S, et al. Effectiveness of Problem-Based Learning in Chinese Pharmacy Education: A Meta-Analysis. BMC Medical Education, 2016; 16(1): 23.
144. Gurpinar E, Musal B, Aksakoglu G, Ucku R. Comparison of Knowledge Scores of Medical Students in Problem-Based Learning and Traditional Curriculum on Public Health Topics. BMC Medical Education, 2005; 5(1): 7.
145. Jay J. Problem Based Learning-a Review of Students' Perceptions in an Occupational Therapy Undergraduate Curriculum. South African Journal of Occupational Therapy, 2014; 44(1): 56-61.
146. McDonald PL, Straker HO, Schlumpf KS, Plack MM. Learning Partnership: Students and Faculty Learning Together to Facilitate Reflection and Higher Order Thinking in a Blended Course. Online Learning, 2014; 18(4).
147. Poon J. Blended Learning: An Institutional Approach for Enhancing Students' Learning Experiences. Journal of Online Learning & Teaching, 2013; 9(2): 271.
148. Ellaway R, Masters K. Amee Guide 32: E-Learning in Medical Education Part 1: Learning, Teaching and Assessment. Medical Teacher, 2008; 30: 455-473.
149. Erdem M, Kibar PN. Students' Opinions on Facebook Supported Blended Learning Environment. TOJET : The Turkish Online Journal of Educational Technology, 2014; 13(1).

150. Norberg A, Dziuban CD, Moskal PD. A Time-Based Blended Learning Model. On the Horizon, 2011; 19(3): 207-216.
151. Alammary A, Sheard J, Carbone A. Blended Learning in Higher Education: Three Different Design Approaches. Australasian Journal of Educational Technology, 2014; 30(4): 440-454.
152. Wei-Chieh Wayne YU, Chunfu Charlie LIN, Mei-Hsin HO, Jenny W. Technology Facilitated Pbl Pedagogy and Its Impact on Nursing Student's Academic Achievement and Critical Thinking Dispositions. Turkish Online Journal of Educational Technology, 2015; 14(1): 97-107.
153. Moeller S, Spitzer K, Spreckelsen C. How to Configure Blended Problem Based Learning – Results of a Randomized Trial. Medical Teacher, 2010; 32(8): e328-e346.
154. Thomas G, Duddu V, Gater R. Blending an E-Learning Package into a Problem-Based Learning Module. International Journal of Medical Education, 2016; 7: 259-260.
155. The Higher Education Quality Committee. Criteria for Institutional Audits. Pretoria: Council on Higher Education, 2004.
156. Concha M. Occupational Therapy at the University of the Witwatersrand – the Past, the Present and the Future. South African Journal of Occupational Therapy, 2014; 44(1): 1-2.
157. McMillan W. Theory in Healthcare Education: The Importance of Worldview. In: Cleland J, Durning SJ, editors. Researching Medical Education. West Sussex: John Wiley & Sons, Ltd.; 2015. p. 14-23.
158. Mann K, MacLeod A. Constructivism: Learning Theories and Approaches to Research. In: Cleland J, Durning SJ, editors. Researching Medical Education. West Sussex: John Wiley & Sons, Ltd; 2015. p. 49-65.
159. Herr K, Anderson GL. The Action Research Dissertation: A Guide for Students and Faculty: Sage Publications, Incorporated, 2005.
160. Harfoushi OK, Obiedat RF, Khasawneh SS. E-Learning Adoption inside Jordanian Organizations from Change Management Perspective. International Journal of Emerging Technologies in Learning, 2010; 5(2): 49-60.
161. Lave J, Wenger E. Situated Learning: Legitimate Peripheral Participation: Cambridge University Press, 1991.
162. Creswell JW. Research Design: Qualitative, Quantitative and Mixed Methods Approaches. 2nd ed. California: SAGE Publications, 2003.
163. Baumfield V, Hall E, Wall K. Action Research in the Classroom. London: SAGE Publications Ltd., 2008.
164. Kielhofner G. Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice. Philidephia: F.A. Davis Company, 2006.
165. Löfman P, Pelkonen M, Pietilä A. Ethical Issues in Participatory Action Research. Scandinavian Journal of Caring Sciences, 2004; 18(3): 333-340.
166. McTaggart R. Principles for Participatory Action Research. Adult education quarterly, 1991; 41(3): 168-187.
167. Mubuuke AG, Leibowitz B. Participatory Action Research: The Key to Successful Implementation of Innovations in Health Professions Education. African Journal of Health Professions Education, 2013; 5(1): 30-33.
168. Mason K. Participatory Action Research: Coproduction, Governance and Care. Geography Compass, 2015; 9(9): 497-507.
169. Frantz JM. A Faculty Development Strategy among Academics to Promote the Scholarship of Research. African Journal of Health Professions Education, 2012; 4(2): 118-122.
170. Glassman M, Erdem G, Bartholomew M. Action Research and Its History as an Adult Education Movement for Social Change. Adult Education Quarterly, 2013; 63(3): 272-288.
171. Mash B. African Primary Care Research: Participatory Action Research. La recherche sur les soins de santé primaire en Afrique: la recherche sur l'action participative, 2014; 6(1): 1-5.

172. Carr W, Kemmis S. Becoming Critical: Education Knowledge and Action Research. Oxon: Deakin University Press, 1986.
173. Masters K, Ellaway R. E-Learning in Medical Education Guide 32 Part 2: Technology, Management and Design. Medical Teacher, 2008; 30: 474-489.
174. Dahl KKB. 'From Worse to Better': How Kenyan Student-Teachers Can Use Participatory Action Research in Health Education. Educational Action Research, 2014; 22(2): 159-177.
175. Flynn E, Woodward-Kron R, Hu W. Training for Staff Who Support Students. Clinical Teacher, 2016; 13(1): 63-68.
176. Scott MA, Pyne KB, Means DR. Approaching Praxis: Ypar as Critical Pedagogical Process in a College Access Program. High School Journal, 2015; 98(2): 138.
177. Braun V, Clarke V. Successful Qualitative Research: A Practical Guide for Beginners. London: SAGE Publications Ltd, 2013.
178. Zaforteza C, Gastaldo D, Moreno C, Bover A, Miró R, Miró M. Transforming a Conservative Clinical Setting: Icu Nurses' Strategies to Improve Care for Patients' Relatives through a Participatory Action Research. Nursing Inquiry, 2015; 22(4): 336-347.
179. Brookfield S. Critically Reflective Practice. Journal of Continuing Education in the Health Professions, 1998; 18(4): 197-205.
180. McNiff J, Whitehead J. Doing and Writing Action Research. London: Sage Publications Ltd., 2009.
181. BioMed Central Ltd. "Bmc Medical Education: About". Springer Nature. 2018. <https://bmcmededuc.biomedcentral.com/about> [Accessed 09 February 2018]
182. Noergaard B, Johannessen H, Fenger-Gron J, Kofoed P-E, Ammentorp J. Participatory Action Research in the Field of Neonatal Intensive Care: Developing an Intervention to Meet the Fathers' Needs. A Case Study. Journal of Public Health Research, 2016; 5(3): 122-129.
183. Lorenzetti L, Ann Walsh C. Is There an 'F' in Your Par? Understanding, Teaching and Doing Action Research. Canadian Journal of Action Research, 2014; 15(1): 50-64.
184. Dunbar SB. Occupational Therapy Models for Intervention with Children and Families: SLACK, 2007.
185. Dyke M, Conole G, Ravenscroft A, Freitas Sd. Learning Theory and Its Application to E-Learning. In: Conole G, Oliver M, editors. Contemporary Perspectives in E-Learning Research: Themes, Methods and Impact on Practice. Oxon: Routledge; 2007. p. 82-97.
186. Psybergate Pty (Ltd). Learning Management System Evaluation Report. Johannesburg: University of the Witwatersrand, 2011.
187. Dodge B. "Some Thoughts About Webquests". 1995. <http://webquest.org/sdsu/about_webquests.html> [Accessed 27 June 2016]
188. Corbin J, Strauss A. Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Fourth ed. California: SAGE Publications Ltd., 2015.
189. Brookfield SD. Using the Lenses of Critically Reflective Teaching in the Community College Classroom. New Directions for Community Colleges, 2002; 2002(118): 31.
190. University of the Witwatersrand. "Wits University Revises Its Mbbch Degree Admissions Policy". 2016. <https://www.wits.ac.za/media/wits-university/faculties-and-schools/health-sciences/student-documents/undergraduate/Wits%20University%20Revised%20Health%20Sciences%20Admissions%20Policy.pdf> [Accessed 08 November 2017]
191. The Moodle Project. "Moodle". 2018. <https://moodle.org> [Accessed 15 April 2018]
192. Sakai Project. "Welcom to Sakai". Apereo Foundation. 2014. <https://www.sakaiproject.org/> [Accessed 15 April 2018]
193. Sims R. Rethinking (E)Learning: A Manifesto for Connected Generations. Distance Education, 2008; 29: 153-164.
194. McLaughlin JE, Rhoney DH. Comparison of an Interactive E-Learning Preparatory Tool and a Conventional Downloadable Handout Used within a Flipped Neurologic Pharmacotherapy Lecture. Currents in Pharmacy Teaching and Learning, 2015; 7(1): 12-19.

195. Luo L, Cheng X, Wang S, Zhang J, Zhu W, Yang J, et al. Blended Learning with Moodle in Medical Statistics: An Assessment of Knowledge, Attitudes and Practices Relating to E-Learning. BMC Medical Education, 2017; 17(1): 170.
196. Gray K, Tobin J. Introducing an Online Community into a Clinical Education Setting: A Pilot Study of Student and Staff Engagement and Outcomes Using Blended Learning. BMC Medical Education, 2010; 10(1): 6.
197. "Elearning Support and Innovation: About Us". University of the Witwatersrand. 2012. <https://elearn.wits.ac.za/home/default/ELSI/> [Accessed 17 April 2018]
198. Bryant J, Matthews G, Walton G. Academic Libraries and Social and Learning Space: A Case Study of Loughborough University Library, Uk. Journal of Librarianship and Information Science, 2009; 41(1): 7-18.
199. Minors D. Death of the Chalkboard and the Demise of the Sage on the Stage. Curiosity. 2017:24-25.

# Appendices

*Appendix A: Ethical Clearance Certificates | Human Research Ethics Committee (Medical)*

**Certificate No: M090920**

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**

Division of the Deputy Registrar (Research)

**HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)**
R14/49 Ms Paula Barnard

| | |
|---|---|
| **CLEARANCE CERTIFICATE** | **M090920** |
| **PROJECT** | Profiling E-Leaner and E-Lecturer Behaviour within an Occupational Therapy Undergraduate Curriculum to Better Predict E-Learner Performance |
| **INVESTIGATORS** | Ms Paula Barnard. |
| **DEPARTMENT** | Occupational Therapy Department |
| **DATE CONSIDERED** | 2009/10/02 |
| **DECISION OF THE COMMITTEE*** | Approved unconditionally |

**Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.**

**DATE** 2009/11/12 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof A Rothberg

---

**DECLARATION OF INVESTIGATOR(S)**

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...
.....

**Certificate No: M160877**

R14/49 Ms Paula Barnard

## HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

## CLEARANCE CERTIFICATE NO. M160877

| | |
|---|---|
| **NAME: (Principal Investigator)** | Ms Paula Barnard |
| **DEPARTMENT:** | Occupational Therapy |
| **PROJECT TITLE:** | Profiling E-Learner and E-Lecturer Behaviour Within an Occupational Therapy Undergraduate Curriculum to Better Predict E-Learner Perfomance |
| **DATE CONSIDERED:** | 26/08/2016 |
| **DECISION:** | Approved unconditionally |
| **CONDITIONS:** | Renewal for the Period August 2016 - August 2021 Previously M090920 |
| **SUPERVISOR:** | Prof A Rothberg |

**APPROVED BY:** Professor P Cleaton-Jones, Chairperson, HREC (Medical)

**DATE OF APPROVAL:** 29/08/2016

**This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.**

**DECLARATION OF INVESTIGATORS**

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004, 10th floor, Senate House/2nd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in August and will therefore be due in the month of August each year.

Principal Investigator Signature Date

**PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES**

**Certificate No: M141168 (WebQuest – inclusion of Physiotherapy student data)**

**Human Research Ethics Committee (Medical)**

Research Office Secretariat: Senate House Room SH 10005, 10th floor. Tel +27 (0)11-717-1252
Medical School Secretariat: PV Tobias Building Room 306, 3rd Floor. Tel +27 (0)11-717-2700
Private Bag 3, Wits 2050, www.wits.ac.za. Fax +27 (0)11-717-1265

**UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG**
Office of the Deputy Vice-Chancellor Research & Post Graduate Affairs

**MEMORANDUM**

**TO:** **Ms Janine van der Linde and Paula Barnard**
School of Therapeutic Sciences
E-mail: janine.vanderlinde@wits.ac.za

**FROM:** **Ms Zanele Ndlovu**
Administrative Officer: Human Research Ethics Committee (Medical)
Tel: 011 717-1252
E-mail: zanele.ndlovu@wits.ac.za

**DATE:** 15 December 2014

**REF:** ***R14/49***

**PROTOCOL NO: M141168** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

The protocol below was considered at a meeting of the Human Research Ethics Committee (Medical**) on Friday 28 November 2014.** The Committee requires the following amendments/corrections/information from you before your application can be approved.

**Project Title:** The Impact of Webquests to Introduce e-Learning to First year Students; on Competence and Perception of eLearning

**Conditions:** **Approved subject to:**

- Providing written permision to conduct the study from the Dean of Student Support
- Database - Assure that identifiers will be coded and link file kept separate.

**NB:**

1. **Please submit a covering letter (list all the conditions above and write your response below the each condition and attach relevant documentation), highlight any changes made and send two hard copies to this office. The default for submission is hardcopies –Amendments send by email will not be considered.**
2. **Amendments must be delivered at Faculty of Health Sciences, Phillip Tobias Building, second floor, Cnr York Road and Princess of Wales Terrance**
3. **Office hours: 08h30–17h00** *(Lunch 13h00-14h00)*

## *Appendix B: Turn-It-In Report*

PhD Final

ORIGINALITY REPORT

| 14% | 11% | 7% | 7% |
|---|---|---|---|
| SIMILARITY INDEX | INTERNET SOURCES | PUBLICATIONS | STUDENT PAPERS |

PRIMARY SOURCES

| | | |
|---|---|---|
| 1 | Submitted to University of Witwatersrand<br>Student Paper | 2% |
| 2 | presentations.wits.ac.za<br>Internet Source | 1% |
| 3 | library.iated.org<br>Internet Source | 1% |
| 4 | sajot.co.za<br>Internet Source | 1% |
| 5 | Submitted to Grand Canyon University<br>Student Paper | <1% |
| 6 | www.infona.pl<br>Internet Source | <1% |
| 7 | otasa.org.za<br>Internet Source | <1% |
| 8 | eprints.hud.ac.uk<br>Internet Source | <1% |
| 9 | www.ruthmalan.com<br>Internet Source | <1% |
| 10 | www.ncbi.nlm.nih.gov<br>Internet Source | <1% |
| 11 | Submitted to Rush University<br>Student Paper | <1% |
| 12 | www.tojet.net<br>Internet Source | <1% |
| 13 | open.uct.ac.za<br>Internet Source | <1% |
| 14 | etd.lib.metu.edu.tr<br>Internet Source | <1% |
| 15 | www.wits.ac.za<br>Internet Source | <1% |
| 16 | www.biomedcentral.com<br>Internet Source | <1% |
| 17 | onlinelibrary.wiley.com<br>Internet Source | <1% |
| 18 | www.che.ac.za<br>Internet Source | <1% |
| 19 | uir.unisa.ac.za<br>Internet Source | <1% |
| 20 | doaj.org<br>Internet Source | <1% |
| 21 | www1.carleton.ca<br>Internet Source | <1% |
| 22 | journal.alt.ac.uk<br>Internet Source | <1% |
| 23 | www.jmir.org<br>Internet Source | <1% |
| 24 | International Handbook of Information Technology in Primary and Secondary Education, 2008.<br>Publication | <1% |
| 25 | scholar.sun.ac.za<br>Internet Source | <1% |
| 26 | Shaman Rajindrajith, Arunasalam Pathmeswaran, Chamilka Jayasinghe, Dulani Kottahachchi et al. "Non-alcoholic fatty liver disease and its associations among adolescents in an urban, Sri Lankan community", BMC Gastroenterology, 2017<br>Publication | <1% |
| 27 | openair.rgu.ac.uk<br>Internet Source | <1% |
| 28 | www.che.org.za<br>Internet Source | <1% |
| 29 | Scott, Karen M., Arany Nerminathan, Shirley Alexander, Megan Phelps, and Amanda Harrison. "Using mobile devices for learning in clinical settings: A mixed-methods study of medical student, physician and patient perspectives : Mobile devices for learning in clinical settings", British Journal of Educational Technology, 2015.<br>Publication | |
| 30 | www.tandfonline.com<br>Internet Source | <1% |
| 31 | Submitted to University of New England<br>Student Paper | <1% |
| 32 | "E-Learning in the Middle East and North Africa (MENA) Region", Springer Nature, 2018<br>Publication | <1% |
| 33 | Submitted to Southern Cross University<br>Student Paper | <1% |
| 34 | su-beta.diva-portal.org<br>Internet Source | <1% |
| 35 | www.research2012.uct.ac.za<br>Internet Source | <1% |
| 36 | Submitted to University of Stellenbosch, South Africa<br>Student Paper | <1% |
| 37 | download.lww.com<br>Internet Source | <1% |
| 38 | Submitted to University of Brighton<br>Student Paper | <1% |

| | | |
|---|---|---|
| 39 | www.med.ubc.ca<br>Internet Source | <1% |
| 40 | "On the Line", Springer Nature, 2018<br>Publication | <1% |
| 41 | Submitted to University of Southampton<br>Student Paper | <1% |
| 42 | www.mdpi.com<br>Internet Source | <1% |
| 43 | Submitted to University of Nottingham<br>Student Paper | <1% |
| 44 | www.ci.org.za<br>Internet Source | <1% |
| 45 | Submitted to University of Newcastle<br>Student Paper | <1% |
| 46 | 67.207.206.99<br>Internet Source | <1% |
| 47 | Barbara Hooper, Robin King, Wendy Wood, Andrea Bilics, Jyothi Gupta. "An International Systematic Mapping Review of Educational Approaches and Teaching Methods in Occupational Therapy", British Journal of Occupational Therapy, 2013<br>Publication | <1% |
| 48 | Semsettin MS Şahin, Meltem Huri Baturay.<br>"The effect of 5E-learning model supported with WebQuest media on students' achievement and satisfaction", E-Learning and Digital Media, 2016<br>Publication | <1% |
| 49 | ml2lab.nctu.edu.tw<br>Internet Source | <1% |
| 50 | www.globalhealthaction.net<br>Internet Source | <1% |
| 51 | worldwidescience.org<br>Internet Source | <1% |
| 52 | repositorium.sdum.uminho.pt<br>Internet Source | <1% |
| 53 | www.sayvon.org.za<br>Internet Source | <1% |
| 54 | wiredspace.wits.ac.za<br>Internet Source | <1% |
| 55 | ncl.ac.uk<br>Internet Source | <1% |
| 56 | www.selcuktipdergisi.org<br>Internet Source | <1% |
| 57 | Subramaniam, Karthigeyan. "How WebQuests Can Enhance Science Learning Principles in the Classroom", The Clearing House A Journal of Educational Strategies Issues and Ideas, 2012.<br>Publication | <1% |
| 58 | menntamidja.is<br>Internet Source | <1% |
| 59 | files.eric.ed.gov<br>Internet Source | <1% |
| 60 | users.ugent.be<br>Internet Source | <1% |
| 61 | "Information Literacy. Lifelong Learning and Digital Citizenship in the 21st Century", Springer Nature, 2014<br>Publication | <1% |
| 62 | www.iet-c.net<br>Internet Source | <1% |
| 63 | etheses.bham.ac.uk<br>Internet Source | <1% |
| 64 | jeatdisord.biomedcentral.com<br>Internet Source | <1% |
| 65 | Submitted to University of Leeds<br>Student Paper | <1% |
| 66 | Stephen Asunka. "chapter 22 Using the WebQuest Approach to Elicit Student Engagement in a University Course", IGI Global, 2018<br>Publication | <1% |
| 67 | Submitted to University of South Australia<br>Student Paper | <1% |
| 68 | es.scribd.com<br>Internet Source | <1% |
| 69 | www.stou.ac.th<br>Internet Source | <1% |
| 70 | Wan Ng. "New Digital Technology in Education", Springer Nature, 2015<br>Publication | <1% |
| 71 | Submitted to University of Cumbria<br>Student Paper | <1% |
| 72 | Submitted to University of London External System<br>Student Paper | <1% |
| 73 | Submitted to Bridgepoint Education<br>Student Paper | <1% |
| 74 | Leite, Laurinda, Luís Dourado, and Sofia Morgado. "'Sustainability On Earth' WebQuests: Do They Qualify as Problem-Based Learning Activities?", Research in Science Education, 2015.<br>Publication | <1% |
| 75 | "The Palgrave Handbook of Asia Pacific Higher Education", Springer Nature, 2016<br>Publication | <1% |

*Appendix C: EDULEARN 10 congress poster of paper 1*

# E-LECTURER FEEDBACK OF THE INCLUSION OF BLENDED LEARNING IN UNDERGRADUATE OCCUPATIONAL THERAPY

P. Barnard-Ashton | School of Therapeutic Sciences | University of the Witwatersrand (SOUTH AFRICA) | paula.barnard@wits.ac.za

Keywords: Blended learning, occupational therapy, participatory action research.

## Introduction & background

Blended learning is a relatively new development within the occupational therapy curriculum at the University of the Witwatersrand. Traditionally this curriculum has been a purely Face - 2 - Face (F2F), problem-based learning (PBL) design. This curriculum has a particularly high demand on lecturer resources due to the group work and practical, clinical nature of the curriculum. The incorporation of blended learning was adopted (2009) as a means of enhancing the learning opportunities, optimising communication within the occupational therapy courses and alleviating some of the lecturer time resources.

The School of Therapeutic Science e-Learning Project supports the development of blended learning, including the development of virtual learning environments (VLEs), staff and student training, investigation and implementation of blended learning strategies and researching the effectiveness of the project.

## Aims of the study

The terms e-Lecturer and e-Learner are used to represent the roles of the participants within the blended learning approach. This paper focuses on the beliefs, attitudes and behaviours of the e-Lecturer after the first term of 2010. The study aimed to:

- Document e-Lecturer behaviour in order to determine the level of uptake of blended learning by e-Lecturers.
- Determine e-Lecturer belief in the value of blended learning.
- Determine e-Lecturer attitude towards blended learning.
- Determine e-Lecture VLE tool preferences.

## Method

This paper presents the first cycle of a Participatory Action Research (PAR) study (term 1 of 2010). PAR involves a cyclical process of

~ investigating the problem (refer 1);
~ collaborating with stakeholders (refer 2)
~ implementing the strategy/action (refer 3), and
~ investigating (refer 4) the impact of the action.

The overall impressions of the first term from the e-Lecturer perspective are covered here.

The PAR study implemented a mixed methods design with the quantitative data analysed descriptively and qualitative data analysed for themes using a single level horizontal thematic analysis.

There were 12 e-Lecturer participants of the 13 DOT lecturer staff.

## 1 The Problem

The problem was identified during a DOT staff meeting. The VLEs were primarily used in 2009 for posting lecture notes or communicating notices to the e-Learners. Moodle would be the platform from the onset of the 2010 academic calendar, unfamiliar new platform generated a level of anxiety.

E-Lecturers expressed the need to reduce their use of time resources, increase their academic output of research and efficiently manage their undergraduate curricular responsibilities.

## 2 Participation Strategy

The strategy consisted of the following components:

- The VLE would remain consistent during 2010 avoiding a mid-year change.
- The VLEs would be branded with the label "e-OT".
- E-Lecturers were invited to attend a morning live Moodle training session.
- E-Lecturers indicated that they would encourage e-Learners to use the discussion boards to post queries (instead of F2F meetings)..
- E-Lecturers were encouraged to use the quiz tool for formative assessments.
- E-Learners would attend a scheduled computer based training session.

The participants agreed that measurement of the participation and efficiency of the blended learning implementation.

## 3 Action

School of Therapeutic Science e-Learning Project assisted the DOT impliment the strategy.




Figure 1. Screen shot of the 3rd year e-OT VLE.

## 4 Investigation

The data collection methods:

- Reflection and comment on blended learning at the monthly staff meetings.
- Online survey, using surveymonkey.com, of the e-Lecturers beliefs and attitude
- E-Lecturer VLE access statistics

The data were collected in the second week of May 2010

## Results and Discussion

| THEME | COMMENT |
|---|---|
| e-Learner positive attitude | • It was reported that students were enthusiastic about e-OT.<br>• Student-staff meetings: e-Learners noticed the increased use of the VLEs and appreciated the availability of resources. |
| Server and network inefficiency | • Chat rooms do not work when the whole class is online.<br>• Class test quiz did not work with the whole class online, class had to be rotated through the test (10-12 e-Learners at a time).<br>• e-Learners and e-Lecturers are unable to access e-OT at times. |
| Plagiarism monitoring software | • The lack of plagiarism monitoring software is of concern. It was available through the Blackboard platform. There is concern about peer copying of clinical reports and assignments. |
| Success | • e-Lecturers feel that are generally able to use the tools on the VLE.<br>• Noted that almost all students were regularly accessing e-OT. |

These four themes (table 1) dominated the discussions under the appropriate agenda item at the three staff meetings.

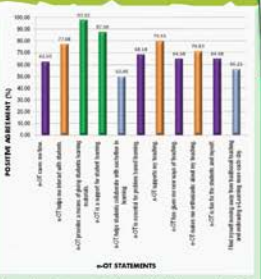



Figure 2. e-Lecturer attitudes and beliefs towards e-OT.

The participants in the study consisted of 12 of the 13 e-Lecturers in the DOT, one e-Learning manager and a graphic designer.

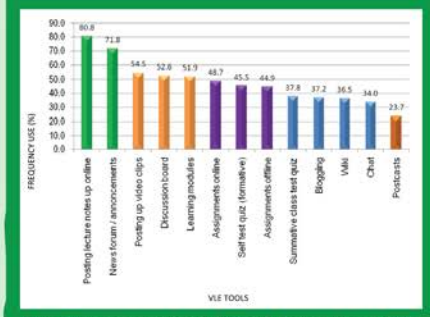



Figure 3. e-Lecturers ranking of use of VLE tools during the first term 2010.

## Conclusion

The results indicate that the e-Lecturers have a positive attitude towards blended learning.

The VLEs were used primarily for posting of lecture materials, but there was more evidence of using the communication tools. Synchronous tools such as chat rooms and class tests were disrupted by inefficiency of the server and networks hosting the VLE platform, which contributed to e-Lecturers reporting frustration.

## Recommendations for the second cycle of the PAR:

~ The migration of the VLE platform to a larger, higher processor server.
~ The e-Learning Project team should facilitate the e-Lecturers to use a broader scope of the VLE tools .
~ Sustain the impetus of blended learning by presenting the results and start of the second cycle.

## *Appendix D: EDULEARN 10 additional posters presented*

# GRAPHIC DESIGN NEEDS OF A BLENDED LEARNING CURRICULUM

University of the Witwatersrand (SOUTH AFRICA) A.P. Mthimkulu and P.M. Barnard-Ashton

Keywords: **e-learning, graphic design, allied health, blended learning**

**INTRODUCTION**

The School of Therapeutic Sciences comprises of 5 academic departments (occupational therapy, physiotherapy, pharmacy and pharmacology, nursing education and sports science), which have started embracing the inclusion of blended learning into the undergraduate curricula. These allied health curricula are very clinical in nature and thus require intense F2F learning activities. Lecturers have been positive about using blended learning activities to enhance the teaching and supervision of students as it allows for good communication, information dissemination and collaboration in learning.

The aim of the study was to review the use of graphic design by lecturers in their teaching activities, investigate lecturer attitude towards using graphic design, and their future needs in terms of graphic design support.

**METHOD**

An electronic survey of the academics of the STS was conducted. The link to the survey was emailed to 44 academics, and posted on the VLE that is used for lecturer collaboration. The survey explored the use of the graphic design in teaching activities through a checklist, and lecturer perceptions through short questions and multiple choice questions. The survey was hosted by surveymonkey.com which recorded the responses. The results were analysed descriptively.

**RESULTS**

There were 25 respondents to the electronic survey, resulting in a 56.8% response rate. Occupational therapy lecturers formed 28% of the respondents, with 24% being nursing educators, 16% physiotherapists an 4% being pharmacy and sports medicine lectures alike. 24% did not specify their profession.

**Lecturers perspective on graphic design in blended learning.**

Lectures were asked to indicate the impression that having an in-house graphic designer has made on their teaching practice. Fig 1 shows that the majority (68.4%) of respondents felt that it has changed the way they think about presenting teaching information.

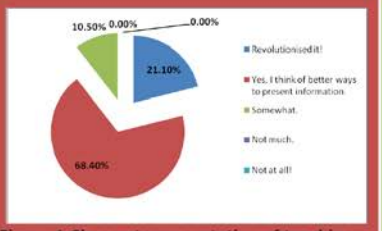



**Figure 1 Change to presentation of teaching material**

There were no respondents who felt that this support made little or no impact on the way they think about their teaching practice. This is an overwhelmingly positive response indicating that all the lecturers have embraced the inclusion of graphic design material into their teaching practice.

There was a strong indication that this support made their teaching practice look more professional to the students, colleagues and the community. They feel that it also enhances the professional look and feel of the department through having consistent and well designed email signatures and uniformity across the VLEs.

**Use of graphic design**

Fig. 2 illustrates how the respondents have used their support from the graphic designer over the past year and a half.

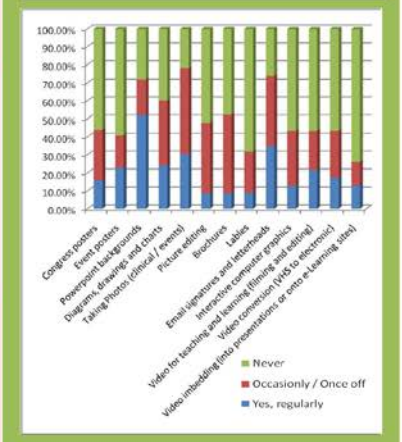



**Figure 2 Use of graphic design by lecturers**

Many lecturers have used the graphic design support for taking photographs; developing diagrams, drawings and charts; creating powerpoint backgrounds; and email signatures and letterheads. Some lecturers commented that they only realised the nature of the support that could be provided after seeing what other lecturers had done.

In exploring the future needs of the lecturers, fig. 3 illustrates the shift towards animation and video support. Lecturers are becoming more creative as they get to know the potential of media in their teaching activities. There is a definite shift of thinking from static media auch as inages towards animations and videos.

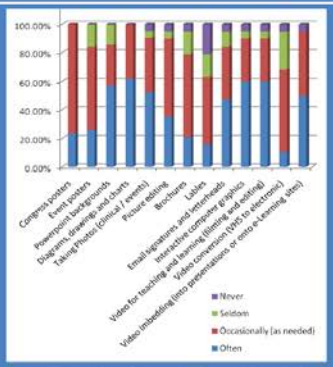



**Figure 3 Percieved need of graphic design support in the future.**

Lecturers have commented that it is important to have video content that is contextually relevant to the clients. Videos and images can say things that words can't fully explain.

A barrier is that there is only one designer for the 5 departments and that his time is therefor a valued comodity. They also noted their own time is often restricted impacting their implimenting such ideas.

**CONCLUSION**

The STS lecturers have fully embraced the power that the inclusion of graphic design media on their teaching practice, and see the potential of this in curricula development. Lecturers have noted that by enhancing the presentation of information with images, animations and video media the students are able to learn more efficiently and have better attention to the information.

While in the past the lecturers have mostly used the graphic design support for taking photographs, developing PowerPoint backgrounds and creating email signatures and letterheads, there is a definite need to develop animation and video media in the future. Most lecturers cited time constraints as the biggest barrier to using the graphic design support, both in terms of their own time and that of the STS e-Learning project.

This indicates the need for expanding the STS e-Learning Project's staffing to increase the availability of graphic design support to the lecturers of the STS. The STS lecturers are enthusiastic about the potential e-Learning enhancements that they can now make to their teaching to embed blended learning further in the curricula delivery.

**REFERENCES**

1. A. Heinze and B. Heinze, "Blended e-learning skeleton of conversation: Improving formative assessment in undergraduate dissertation supervision," British Journal of Educational Technology, vol. 40, pp. 294-305, 2009.
2. J. M. Keller, "First principles of motivation to learn and e3-learning," Distance Education, vol. 29, pp. 175-185, 08 2008.
3. R. Sims, "Rethinking (e)learning: a manifesto for connected generations," Distance Education, vol. 29, pp. 153-164, 08 2008.
4. R. Kop and A. Hill, "Connectivism: Learning Theory of the Future or Vestige of the Past?," International Review of Research in Open and Distance Learning, vol. 9, pp. 1-13, 2008.
5. N. Bush and G. Codrington, Future-Proof Your Child. Johannesburg: Penguin Group, 2008.
6. G. Kielhofner, Research in Occupational Therapy: Methods of Inquiry for Enhancing Practice. Philidephia: F.A. Davis Company, 2006.

# USING WIKI'S IN PROBLEM BASED LEARNING: E-LEARNER BEHAVIOUR AND ATTITUDE

P. Barnard-Ashton , University of the Witwatersrand (SOUTH AFRICA), paula.barnard@wits.ac.za

## INTRODUCTION

Problem Based Learning (PBL) has been the primary method of curriculum delivery for the undergraduate occupational therapy curriculum since 1995. Students in a PBL curriculum are expected to be self directed learners, work in groups with a facilitator, consult the literature, and explore clinical environments to solve the problem.

Blended learning has only recently been incorporated and use of a wiki was considered to be the optimal method of collaborative content development to solve the problem objectives.

The 2009 second year occupational therapy students completed their physical internal performance components problem. The students had access to a course VLE enabled by WebCT/Blackboard. Wiki's, in the form of Google Docs were introduced to the class as a collaboration tool. The effectiveness of this intervention was evaluated through a survey of the students and feedback from the facilitators involved.

The results of the investigation were then used to facilitate the implementation of wiki's in a problem workshop the following year (students in 3rd year of study). During this year the course VLE's enabled through Moodle which has a wiki tool facility which was viewed as a benefit of using this platform. This paper reviews the results of the first and second implementations of the wiki's into PBL curriculum delivery.

## METHOD

### Second Year PBL 2009

The study sample was 33 students, in 4 problem groups (each investigating a different clinical case). One Google document was created per PBL group. Students could access and edit the group document at any time throughout the problem, on or off site. Each group collaborated to produce a document through the wiki which covered the learning objectives of the problem. Final documents of all four groups were posted on WebCT for full class access.

On completion the students completed a survey on their experience of using the wiki's as a learning tool. The survey was handed out during a class lecture and students were under no obligation to complete it. The results were analysed descriptively.

### Third Year PBL Workshop 2010

The 39 3rd year occupational therapy students were divided into 6 problem groups for their introduction to learning disabilities problem. Amendments to the use of the wiki's resulting from the analysis of the second year problem included the following:

- The wiki tool was part of their VLE and did not require separate registration.
- Wiki's were contained to one learning objective and not the entire problem's objectives.
- Wiki's were developed and contributed towards during a class workshop period as opposed to during self learning time.

Learning behaviour was measured through the history tracking and VLE access logs for the period of the wiki development and use. The results were analysed descriptively.

## RESULTS AND DISCUSSION

### Results of Second Year PBL 2009

Fig. 1 shows the proportion of students who successfully accessed the wiki to those that have accessed their course VLE. There is consistency between access to the wiki and access to the course VLE. The student expectation (fig. 2) of the use of wiki's and their actual experience (fig. 3) of using the wiki's was documented, showing that while students were positive at the outset, their experience was negative, with the majority not wishing to use the tool again. From figure 3 it is possible to postulate that one PBL group had a good experience as a quarter of the class.

*The positive comments noted were:*

- Nice to have all information in one place. We are sure of getting every ones work.
- Good to get all the information from all the groups.
- I like knowing that we have the right objectives.
- It was time efficient.

*The negatives that were noted were:*

- Very frustrating, wasted a lot of time.
- We don't have time to sit at a computer in 2nd year!
- Hard to access as I don't use my student email, why can't we do it on our personal accounts?
- The system often hangs, loosing all my work – even at Wits.
- Others in my group deleted a lot of my work with no regards for how much research I'd done.
- We split the objectives in our group anyway so this was a waste of time.
- Some use it as a dumping ground for cutting and pasting lots of irrelevant information.

The quality of the documents created by each group was of good standard as reflected by the group facilitators.

### Results of Third Year PBL Workshop 2010

The use of wiki's in a PBL workshop involved dedicated class time to the collaboration of knowledge and the wiki's were available for access through the class VLE, thus not requiring any separate registration or login.
Fig. 4 illustrates the access of the students to the six group wiki's that were generated for the workshop.

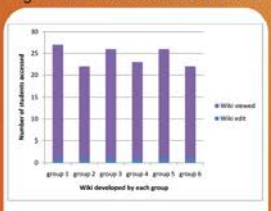



Figure 4. Student access of each group wiki

On reviewing the editing history of the wiki's it was noted that there were a maximum of 4 edits per wiki, all by a single user. This indicated that the students did not collaborate through the wiki, but rather developed the document in another text editor and then pasted the completed text into the wiki. As the task was performed in a workshop time slot, it seems that the groups chose to collaborate in person, not online. The six groups generated high quality documents that were reviewed by the problem co-ordinating lecturer. This indicates that their attitude towards using the wiki tool did not adjust during the transition from 2nd year to 3rd year. In practice all groups chose to circumvent the online collaboration. nature of the wiki tool. Most of the students (54% for wiki groups 2 and 6 to 68% for wiki group 1) have accessed the wiki documents for review and learning purposes to date.

**Results of Second Year PBL 2009**

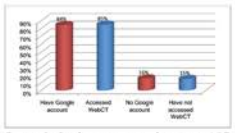


Figure 1. Student access to the course VLE and the group wiki.

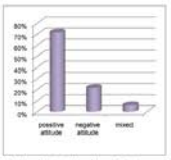



Figure 2. Student attitudes prior to using wiki

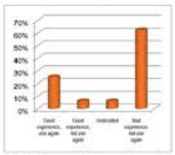


Figure 3. Student attitudes after using wiki

## CONCLUTION

The wiki tool appeared to be potentially a valuable tool in PBL curricular delivery. Investigation into the effectiveness of this tool has however shown that there are some limitations to its use. In the context of this study students did not habitually use collaborative media, and the emergence of blended learning is still relatively new to the students and lecturers of the Department of Occupational Therapy. These are possibly limitations to the evaluation of the true effectiveness of this tool in PBL. This study indicated that students preferred to have autonomy over personal learning materials and appeared not to trust their group members to collaborate effectively. The students felt that they had a negative experience the first time and indicated that they would prefer not to use the tool again even though some of their suggestions were implimented in the 3rd year trial. Here, the students circumvented the tool use by collaborating in person and pasting the completed document into the wiki environment. It is recommended that PBL based curricula should include the use of collaborative media such as wiki's from the beginning of the first year of study as students need the opportunity to adapt to this type of tool.

## *Appendix E: EDULEARN10 verbal presentation*

**DESIGNING E-CURRICULUM BOOKS FOR UNDERGRADUATE OCCUPATIONAL THERAPY: LESSONS LEARNT**

April Papi Mthimkulu,
Paula Barnard-Ashton

School of Therapeutic Sciences | University of the Witwatersrand | Johannesburg | South Africa

STS | e-Learning Project
School of Therapeutic Science | Faculty of Health Science

### Context



### Complexity of the OT curriculum

- Problem Based Learning (PBL)
- Science of Occupation
  - Occupational Performance and Dysfunction
  - Management, Programmes and Research
- Occupational Therapy
  - OT applied to Physical Conditions
  - OT applied to Psychiatric Conditions
- Foundation Sciences

### Original Curriculum Book

- Printed and bound book- 150 pages
  - **High printing costs**
- 2003 = CD of Word Documents
  - Folder of documents – electronic version of print.
  - **Difficult to navigate**
  - **This continued till 2008**

### Blended Learning

- Blended learning was introduced 10/2008
  - Face -2- Face
    - PBL course delivery
  - Virtual Learning Environment / course (Moodle)
    - Supplement Face – 2 – Face learning activity
    - ⇳ Online Student : Lecturer interaction
  - E-Curriculum Book
    - Guide the Learning Objectives
- 1st task was to create an e-Curriculum book to suit the millenial learner
  - 2009 = e-Curriculum Book (HTML)
  - **Easy to navigate – access to right information**
  - **Reduced costs / student**



### Content Management

- e-Curriculum Book contains:
  - the university rules and regulations,
  - course unit structure,
  - PBL problem outlines,
  - learner objectives and
  - requirements for fieldwork and assignments
- Additional content – links, video's, docs, forms




## Lessons Learnt

- Content Lessons:
  - Print friendly
  - Template documents
  - Cast in stone
  - Quantity vs. quality in 700MB
- Design Lessons:
  - Colour association
  - Layout and navigation familiarity
  - 3 click maximum
  - 3D curriculum
- Process Management Lessons:
  - Too many cooks

## Content Lesson 1: Print Friendly

- Experience:
  - HTML is not easily printable
  - Students could manipulate content
- Lesson:
  - content that of high importance =.PDF
  - printer icon also = NB!
  - Unable to edit ⇨ prevent unethical student behaviour

## Content Lesson 2: Template Documents

- Experience:
  - Students like submitting electronic assignments
- Lesson:
  - Template documents in .RTF
  - Students can submit electronically
  - ? Concern of inter-student plagiarism

## Content Lesson 3: Cast in Stone

- Experience:
  - Disadvantage ⇨ once the CD's are burnt the documents are **fixed for the year**.
- Lesson:
  - Requires careful planning and proofing,
    - Current, relevant and accurate documents.
  - Virtual Learning Environments (VLEs) support minor updates.

## Content Lesson 4: Quality vs. Quantity in 700MB

- Experience:
  - Disc has a lot of data space that can be used.
  - To be used wisely.
- Lesson:
  - Prioritisation of content.
  - NB don't create an information overload ⇨ dilute knowledge development.
  - Opportunity to include large size files (e.g. video).

## Design Lesson 1: Colour Association

- Experience:
  - Lecturers and tutors need quick recognition of course year.
- Lesson:
  - Each curriculum year has a colour.
  - Lecturers have all 4 years on 1 CD = easy recognition

## Design Lesson 2: Navigation and Layout Familiarity

- Experience:
  - Students are resistant to change = anxiety
  - Usability is dependant on familiarity
- Lesson:
  - **Minimal changes**
    - to the design images and background look
    - users readily observe the annual update,
  - **Navigation consistent**

## Design Lesson 3: Three Click Maximum

- Experience:
  - Students and lecturers want to access the right information fast!
  - Not get "lost" in the CD
- Lesson:
  - We have ensured that there is a 3 click maximum from the menu page
  - to ensure speed and efficiency of navigation

## Design Lesson 4: A 3D Curriculum

- Experience:
  - Print Book limited by linear sequence
- Lesson:
  - The virtual contexts allows for "3D" content relationships through hyperlinks, multi-directional linking of information
  - Result is contextualised and integrated content knowledge

## PROCESS MANAGEMENT

- Requires intensive process management demand on an annual basis.
- All lecturers edit and update their teaching and learning content.
- Updating, proofing, design and production requires strict communication protocols and record keeping for quality assurance.

## Process Management Lesson 1: Too Many Cooks

Experience:

- Up to 13 content contributors and two developers.
- Document over-stamping, footnote dates and document name changes X.
- Collaboration tools such as wiki's?
  - Poor document review.
  - unfamiliar editing tools.
  - bandwidth issues.

Lesson:

- individual .rtf documents per HTML content page.
- use the track changes function
- edited documents to the course co-ordinator.
- The e-Learning developers receive documents from course co-ordinators
  - use the document date-stamp to verify the most current document version.
  - scan for "track change" areas of documents and only convert those portions
- in the future a content management system should be explored

## CONCLUSION

- As per other study – poster
  - Students and lecturers have positively embraced the switch from paper to virtual.
  - a greater sense of course 'citizenship'
- e-Curriculum books provide
  - Students are well informed of learning requirements and objectives.
  - better cross-referencing within the curriculum.
- e-Curriculum books will continue to develop
  - Incorporate podcast and vodcasts
- interface between the e-curriculum books and the course VLEs is not yet seamless,
  - but the design "look and feel" is similar.

*e-Curriculum books have made an innovative contribution to the quality of teaching and learning in the undergraduate occupational therapy curriculum.*

## *Appendix F: Copyright permission from EDULEARN editors for paper 1*

**Paula Barnard**

**From:** EDULEARN16 <edulearn16@iated.org>
**Sent:** 04 February 2017 11:56 AM
**To:** Paula Barnard
**Subject:** Re: Permission to republish EDULEARN10 papers in Thesis
**Attachments:** MTHIMKULU2010DES.pdf; BARNARDASHTON2010USI.pdf; BARNARDASHTON2010ELE.pdf

Dear Paula Barnard,

We wish to inform you that the following articles can be included in your PhD study titled: Profiling e-Learner and e-Lecturer Behaviour within an Occupational Therapy Undergraduate Curriculum to Better Predict e-Learner Performance:

Articles:

E-LECTURER FEEDBACK OF THE INCLUSION OF BLENDED LEARNING IN UNDERGRADUATE OCCUPATIONAL THERAPY
P. Barnard-Ashton - EDULEARN10 Proceedings

USING WIKI'S IN PROBLEM BASED LEARNING: E-LEARNER BEHAVIOUR AND ATTITUDE
P. Barnard-Ashton - EDULEARN10 Proceedings

DESIGNING E-CURRICULUM BOOKS FOR UNDERGRADUATE OCCUPATIONAL THERAPY: LESSONS LEARNT
A.P. Mthimkulu, P. Barnard-Ashton - EDULEARN10 Proceedings

When indexing them, please use the correct citation, following this citation code at:
https://library.iated.org/authors/Paula_Barnard-Ashton
Also, please find attached the paper files as they were included in EDULEARN16 Proceedings.

Thank you for your cooperation and valuable contribution to EDULEARN.
Best regards,

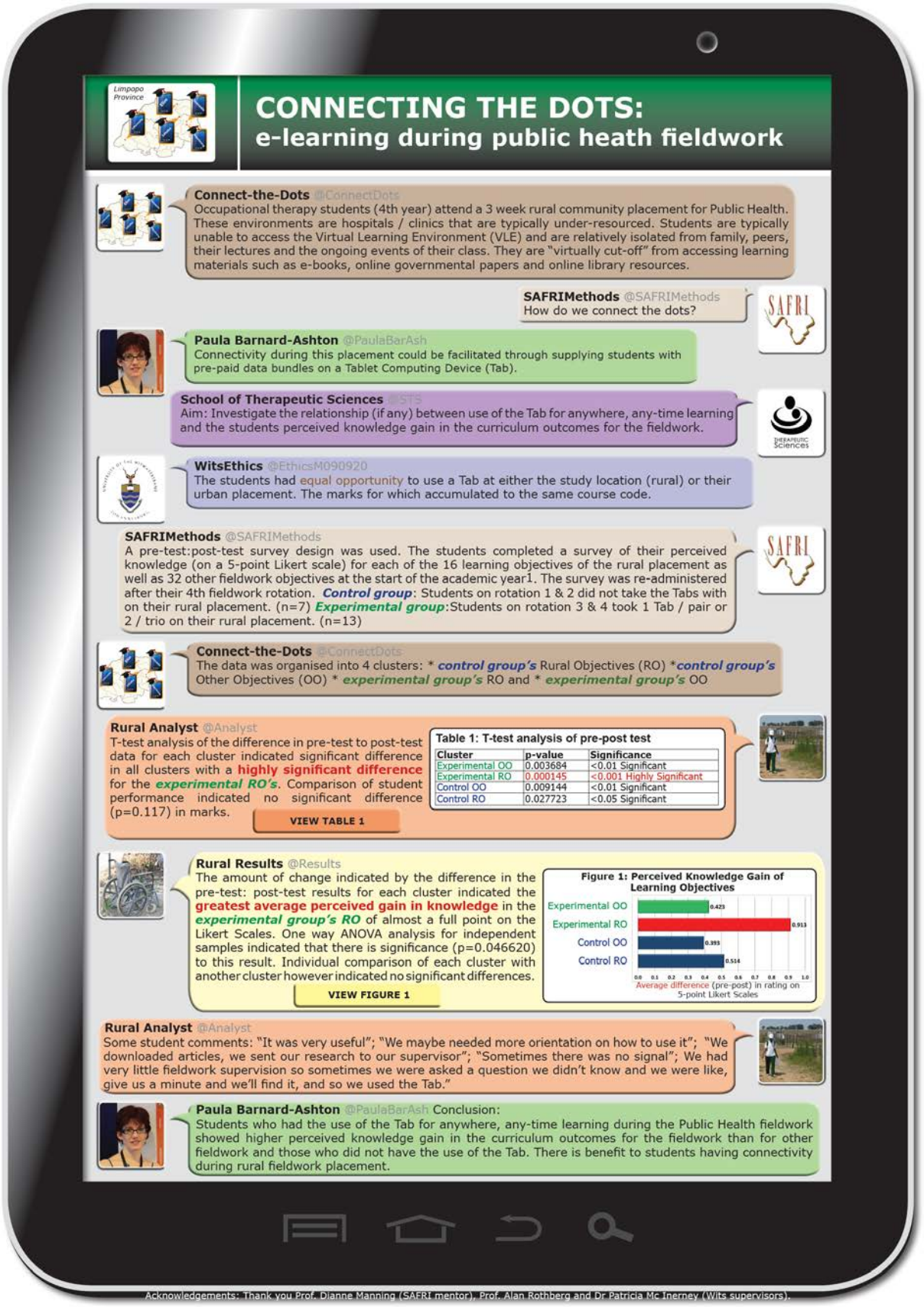
**EDULEARN16 Technical Secretariat**
**Email:** edulearn16@iated.org
**Website:** iated.org/edulearn

*This email and its attachments, if any, contain confidential information and is directed exclusively to the addressee and is protected by Law. Any person other than that to whom it is addressed is expressly forbidden to totally or partially reproduce, use, transmit, copy or print it. If you have received this email in error, please notify the sender immediately and delete this original message and its attachments from your system. In accordance with the provisions of the Data Protection Law, IATED Academy guarantees the adoption of measures to secure the confidential treatment of the personal data. We also inform you that your information will be included in a file under the responsibility of IATED Academy, with the purpose of handling all the commitments arising from the relationship we have with you. If you wish you can exercise your rights of access, rectification, cancellation and opposition by writing a letter to: IATED Academy, at Legion Espanola 11 Bajo. 46010 Valencia. Spain.*

El 18/01/2017 a las 5:17, Paula Barnard escribió:

> Dear IATED
>
> I attended and presented at the EduLearn10 congress in Barcelona Spain,5-7th July 2010. The papers and posters presented formed part of my PhD study titled: **Profiling e-Learner and e-Lecturer Behaviour within an Occupational Therapy Undergraduate Curriculum to Better Predict e-Learner Performance**
> I am in the process of compiling my final thesis document to submit for examination at the University of the Witwatersrand, Johannesburg, South Africa and would like to include the congress proceedings papers as initial chapters, and thus request permission to republish the following:

1


Limpopo Province
CONNECTING THE DOTS:
e-learning during public heath fieldwork
Connect-the-Dots @ConnectDots
Occupational therapy students (4th year) attend a 3 week rural community placement for Public Health. These environments are hospitals / clinics that are typically under-resourced. Students are typically unable to access the Virtual Learning Environment (VLE) and are relatively isolated from family, peers, their lectures and the ongoing events of their class. They are "virtually cut-off" from accessing learning materials such as e-books, online governmental papers and online library resources.
SAFRIMethods @SAFRIMethods
How do we connect the dots?
Paula Barnard-Ashton @PaulaBarAsh
Connectivity during this placement could be facilitated through supplying students with pre-paid data bundles on a Tablet Computing Device (Tab).
School of Therapeutic Sciences @STS
Aim: Investigate the relationship (if any) between use of the Tab for anywhere, any-time learning and the students perceived knowledge gain in the curriculum outcomes for the fieldwork.
WitsEthics @EthicsM090920
The students had equal opportunity to use a Tab at either the study location (rural) or their urban placement. The marks for which accumulated to the same course code.
SAFRIMethods @SAFRIMethods
A pre-test:post-test survey design was used. The students completed a survey of their perceived knowledge (on a 5-point Likert scale) for each of the 16 learning objectives of the rural placement as well as 32 other fieldwork objectives at the start of the academic year1. The survey was re-administered after their 4th fieldwork rotation. Control group: Students on rotation 1 & 2 did not take the Tabs with on their rural placement. (n=7) Experimental group:Students on rotation 3 & 4 took 1 Tab / pair or 2 / trio on their rural placement. (n=13)
Connect-the-Dots @ConnectDots
The data was organised into 4 clusters: * control group's Rural Objectives (RO) *control group's Other Objectives (OO) * experimental group's RO and * experimental group's OO
Rural Analyst @Analyst
T-test analysis of the difference in pre-test to post-test data for each cluster indicated significant difference in all clusters with a highly significant difference for the experimental RO's. Comparison of student performance indicated no significant difference (p=0.117) in marks.
VIEW TABLE 1
Table 1: T-test analysis of pre-post test
Cluster | p-value | Significance
Experimental OO | 0.003684 | <0.01 Significant
Experimental RO | 0.000145 | <0.001 Highly Significant
Control OO | 0.009144 | <0.01 Significant
Control RO | 0.027723 | <0.05 Significant
Rural Results @Results
The amount of change indicated by the difference in the pre-test: post-test results for each cluster indicated the greatest average perceived gain in knowledge in the experimental group's RO of almost a full point on the Likert Scales. One way ANOVA analysis for independent samples indicated that there is significance (p=0.046620) to this result. Individual comparison of each cluster with another cluster however indicated no significant differences.
VIEW FIGURE 1
Figure 1: Perceived Knowledge Gain of Learning Objectives
Experimental OO
Experimental RO
Control OO
Control RO
0.423
0.913
0.393
0.514
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
Average difference (pre-post) in rating on 5-point Likert Scales
Rural Analyst @Analyst
Some student comments: "It was very useful"; "We maybe needed more orientation on how to use it"; "We downloaded articles, we sent our research to our supervisor"; "Sometimes there was no signal"; We had very little fieldwork supervision so sometimes we were asked a question we didn't know and we were like, give us a minute and we'll find it, and so we used the Tab."
Paula Barnard-Ashton @PaulaBarAsh Conclusion:
Students who had the use of the Tab for anywhere, any-time learning during the Public Health fieldwork showed higher perceived knowledge gain in the curriculum outcomes for the fieldwork than for other fieldwork and those who did not have the use of the Tab. There is benefit to students having connectivity during rural fieldwork placement.
Acknowledgements: Thank you Prof. Dianne Manning (SAFRI mentor), Prof. Alan Rothberg and Dr Patricia Mc Inerney (Wits supervisors).

## *Appendix H: Letter from BioMed Central re Copyright for BMC Medical Education*

**From:** Browne, Richard, BioMed Central Ltd.
**To:** Paula Barnard
**Cc:** Maisa, Jose, SPi
**Subject:** RE: Request for Assistance: Copyright permission https://doi.org/10.1186/s12909-017-0977-1
**Date:** 13 April 2018 12:02:23 PM
**Attachments:** image002.png
image004.png

Dear Paula Barnard,

Allow me to introduce myself as a Senior Production Editor for *BioMed Central*.

It is not necessary for you to utilise a letter confirming copyright permissions of your article. As the copyright is retained, as you mention, by the authors, all that is required is to fully and correctly reference the article when it is reproduced. Similar information can be found under the licensing agreement website: https://creativecommons.org/licenses/by/4.0/

Please let me know if you have any further queries.

Warm regards,

**Richard Browne**
*Senior Production Editor*
BMC Open Access Production
BMC