AN E-LEARNING INSTRUCTIONAL DESIGN FRAMEWORK FOR MOBILE DEVICES IN AFRICA

by

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SUPERVISOR: PROF. GEESJE VAN DEN BERG

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DEDICATION AND ACKNOWLEDGEMENT

I dedicate this dissertation to my family, especially to my grandfather, Marius Snyman, who passed away in 2014, but whose life still speaks generous peace and of enabling others. You are the people closest to my heart, who have patiently endured alongside me, encouraged me in my life choices and supported my decisions. Thank you for being such a wonderful blessing and paving the way for me to walk in.

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Ultimately, I thank God for inspiration, dedication and giving me a dream! It is all for His glory and purpose!

DECLARATION

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I declare that *An E-learning instructional design framework for mobile devices in Africa,* is my own work and that all the sources I used or quoted have been indicted and acknowledge by means of complete references.

December 2018

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Signature   Date

Rachel Garbers

LIST OF ACRONYMS

ACT	American College Testing
ADDIE	Analysis, Design, Develop, Implement and Evaluate
AI	Artificial Intelligence
ANA	Annual National Assessment
ANC	African National Congress
BYOD	Bring Your Own Device
CAPS	South African Curriculum and Assessment Policy Statements
CDSS	Community Day Secondary Schools
CSCL	Computer Supported Collaborative Learning
CSS	Conventional Secondary Schools
CTE	Career and Technical Education
DBE	Department of Basic Education
ECD	Early Childhood Development
ED	U.S. Department of Education
EDUFI	Finnish National Agency for Education
ELL	English Language Learners
EQ	emotional intelligence quotient
ERIC	Education Resources Information Center
ESP	English for Special Purposes
ESS	Education Support Services
ESSA	Every Student Succeeds Act
FCC	Federal Communications Commission

FERPA	Family Educational Rights and Privacy Act
FET	Further Education and Training
FNBE	Finnish National Board of Education
FTTP	Fibre-to-the -premises
GET	General Education and Training
GHS	General Household Survey
HRD	Human Resource Development
ICT	Information and Communication Technologies
ID	Instructional Design
IDEA	Individuals with Disabilities Education Act
IEB	Independent Examinations Board
IES	Institute of Education Sciences
IOS	Operating System for Apple devices
IP	Internet Protocol
IQ	Intelligence Quotient
ISD	Instructional Systems Design
K-12	Kindergarten to Grade 12
KBC	Knowledge Based Curriculum
LMS	Learning Management Systems
LSEN	Learners with special educational needs
LTE	Long-Term evolution
LTSM	Learning and Teaching Support Material
MALL	Mobile Assisted Language Learning
M-COPE	Mobile Conditions Outcomes Pedagogy and Ethics

MCQ	Multiple Choice Questions
MCSCL	Mobile Computer Supported Collaborative Learning
MIT	Massachusetts Institute of Technology
M-Mobile	Micro- Mobile
MoEC	Ministry of Education and Culture (Finland)
MoEST	Ministry of Education, Science and Technology (Malawi)
MoGCD	Ministry of Gender, Child and Community Development (Malawi)
MoL	Ministry of Labour (Malawi)
MOOCs	Massive Open Online Courses
MSCE	Malawi School Certificate of Education
NADEOSA	National Association of Distance Education and Open Learning in South Africa
NAEP	National Assessment of Educational Progress
NCEE	National Center for Education Evaluation and Regional Assistance
NCER	National Center for Education Research
NCES	National Center for Education Statistics
NCSER	National Center for Special Education Research
NCSNET	National Commission on Special Needs in Education and Training
NDP	National Development Plan
NLE	National Library of Education
NQF	National Qualifications Framework
NRCM	National Research Council of Malawi
NSC	National Senior Certificate
ODL	Open Distance Learning
OECD	Organisation for Economic Co-operation and

OER	Open Educational Resources
P3 model	People, Process and Product model
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
REL	Regional Educational Laboratory Program
RSS	Really Simple Syndication
RUPs	Responsible Use Policies
SAAEA	Southern Africa Association for Educational Assessment
SADC	Southern African Development Community
SAHRC	South African Human Rights Commission
SAQA	South African Qualifications Authority
SAT	Suite of Assessments
SDL	Self-Directed Learning
SECTIONS	Students, Ease of use and reliability, Costs, Teaching and learning, Interactivity, Organisational issues, Novelty, and Speed
SRL	Self-Regulated Learning
STEM	Science, Technology, Engineering and Mathematics
TED	Technology, Entertainment and Design
TIMSS	Trends in Mathematics and Science Study
TIMSSSA	Trends in Mathematics and Science Study South Africa
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
UNISA	University of South Africa
USA	United States of America
USAC	Universal Service Administration Company

VET   Vocational Education and Training (Finland)

Wiki   a website that allows collaborative editing of its content and structure by its users.

WWC   What Works Clearinghouse

xMOOCs   eXtended MOOCs

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AN E-LEARNING INSTRUCTIONAL DESIGN FRAMEWORK FOR MOBILE DEVICES IN AFRICA

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Abstract

This study aims to propose an e-learning framework for mobile devices in Africa to help improve enrolment rates and education standards in the FET (Further Education and Training) phase. The study is qualitative in nature and employs document analysis as main research method. An overview of the South African education context with supporting statistical data to motivate why an e-learning alternative is crucial for improving South African and African education is provided. The literature review includes a descriptive analysis of 7 existing e- and m-learning frameworks, with key features highlighted for possible adaptation or incorporation into an e-learning framework for Africa. Behaviourism, Constructivism and Connectivism are discussed as applicable learning theories to pedagogically underpin this proposed e-learning framework. Thereafter, a critical evaluation of current South African education policy documents (White Papers, the Norms and Standards for Educators and the Draft Policy for the Provision and Management of Learning Teaching and Support Materials) is conducted to determine whether these policies support and enable e-learning effectively. Part 2 of Chapter 5 comprises a critical analysis and comparison of education systems and applicable legislation in the USA, Finland and Malawi to establish how education is structured and how e-learning is administered in these countries to make relevant recommendations for South Africa and to inform the design of an e-learning framework for Africa. Research findings are presented as answers to the research questions posed and the proposed e-learning framework with further

recommendations are presented to the South African Department of Basic Education, teachers and researchers.

Key Terms: e-learning framework; m-learning; instructional design; Further Education and Training (FET) phase; micro-content; micro-learning; Behaviourism; Constructivism; Connectivism; education policy; education white papers; norms and standards for educators; international education systems; Africa; United States of America; Finland; Malawi; high schools; mobile devices

Abstrak

Die doel van hierdie studie is om 'n e-onderrig-en-leer raamwerk vir mobiele toestelle vir Afrika voor te stel, sodat inskrywingsgetalle en onderrig- en leerstandaarde in die Verdere Onderrig en Opleidings (VOO) fase verbeter kan word. Dit is 'n kwalitatiewe studie en dokumentanalise word as navorsingsmetode toegepas. 'n Oorsig van die huidige Suid-Afrikaanse onderwysstelsel en konteks met ondersteunende statistiese bevindinge word verduidelik om e-onderrig-en-leer as noodsaaklike alternatief vir Suid-Afrika en Afrika te motiveer. Die literatuuroorsig sluit 'n beskrywende analise van sewe bestaande e- en m-onderrig-en-leer (mobiele-onderrig-en-leer) raamwerke in. Hoofkenmerke van elke raamwerk word uitgelig vir moontlike aanpassing en inkorporering in 'n e-onderrig-en-leer raamwerk vir die Afrika-konteks. Leerteorië, nl Behaviourisme, Konstruktivisme en Konnektivisme (Connectivism) word in diepte bespreek as pedagogies fundamenteel om die e-onderrig-en-leer raamwerk te onderbou en te ondersteun. 'n Kritiese evaluasie van Suid-Afrikaanse onderwysbeleid (d.w.s. Witskrifte, die Norme and Standaarde vir Onderwysers en die konsepdokument oor die Voorsiening en Bestuur van Onderrig-, Leer- en Ondersteuningsmateriaal) is gedoen om vas te stel of die beleid wel e-onderrig-en-leer effektief ondersteun en prakties moontlik maak. 'n Krities analitiese en vergelykende studie van die VSA (Verenigde State van Amerika), Finland en Malawi se onderwysstelsels- en wetgewing is gedoen in hoofstuk 5 deel 2 om te bepaal hoe dié lande onderwys struktureer en hoe e-onderrig-en–leer geadministreer word, sodat relevante voorstelle vir Suid-Afrika gemaak kan word en om insae te lewer in die ontwerp van 'n e-onderrig-en-leer raamwerk toepaslik vir die Afrika-kontinent.

Navorsingsbevindinge word voorgelê aan die Suid-Afrikaanse Departement van Basiese Onderwys, onderwysers sowel as aan navorsers

Hoofterme: e-leer raamwerk; m-leer; onderrigontwerp; Verdere Onderwys en Opleiding (VOO) fase; mikro-inhoud; mikro-leer; behaviorisme; konstruktivisme; konnektivisme; onderwysbeleid; onderwys witskrifte; norme en standaarde vir onderwysers; internasionale onderwysstelsels; Afrika; Verenigde State van Amerika; Finland; Malawi; hoërskole; mobiele toestelle

Abstract

Lolu cwaningo luhlose ukuphakamisa uhlaka lwe-e-learning lamadivaysi eselula e-Afrika ukusiza ukuthuthukisa izinga lokubhalisa nezindinganiso zemfundo kwiSigaba se-FET (Further Education and Training). Ucwaningo luyimfanelo enemvelo futhi lusebenzisa ukuhlaziywa kwedokhumenti njengendlela yokucwaninga eyinhloko. Ukuhlolisisa umongo wezemfundo waseNingizimu Afrika ngokusekela imniningwane yezibalo ukugqugquzela ukuthi kungani enye yokufunda email ibalulekile ekuthuthukiseni imfundo yaseNingizimu Afrika ne-Afrika. Ukubuyekezwa kwezincwadi kuhlanganisa ukuhlaziywa okuchazayo kwezinhlaka eziyisikhombisa ezisekhona ze-e- e-m-learning, nezici eziyinhloko eziqokonyiswe ukukhishwa kwe-adaption noma ukufakwa kwisakhiwo se-e-learning se-Afrika. Ukuzikhethela, Ukwakhiwa kwe-Constructivism (Kwe Zokwakha) kanye ne-Connectivism (Kwe Zokuxhumana) kuxoxwa njengezifundo ezifanele zokufunda ukusekela lolu hlelo oluhlongozwayo lwe-e-learning. Ngemuva kwaloko, ukuhlolwa okubalulekile kwemibhalo yamanje yemfundo yaseNingizimu Afrika (Amaphepha Asemhlophe, Imigomo Nemigomo Yabafundisi kanye neNqubomgomo Yohlaka Lokufundiswa Nezifundo Nokusekela) kwenziwa ukuze kutholakale ukuthi lezi zinqubomgomo zisekela futhi zikwazi yini ukufundisa nge-e-ephumelelayo. Ingxenye yesibili yeSahluko sesihlanu iqukethe ukuhlaziywa okubucayi kanye nokuqhathaniswa kwezinhlelo zemfundo kanye nemithetho esebenzayo eMelika, eFinland nase Malawi ukuqinisekisa ukuthi imfundo ihlelwe kanjani nokuthi i-e-learning inikezwa kanjani ukwenza izincomo ezifanele eNingizimu Afrika nokwazisa ukuklama uhlaka lwe-e-learning lwe-Afrika. Imiphumela yokucwaninga inikezwa njengezimpendulo zemibuzo yokucwaninga

ephakanyisiwe kanye nohlaka oluhlongozwayo lwe-e-learning kanye nezincomo ezengeziwe ezethulwa eMnyangweni wezemfundo Eyisisekelo, othisha nabacwaningi baseNingizimu Afrika.

Imigomo Yokhiye: uhlaka lwe-e-learning; m-learning; umklamo wokufundisa; Isigaba semfundo eqhubekayo nokuqeqesha (FET); micro-okuqukethwe; ukufunda okuncane; Ukuzinza; Ukwakha; I-Connectivism; inqubomgomo yezemfundo; amaphepha amhlophe amfundo; imigomo namazinga othisha; izinhlelo zemfundo yamazwe ngamazwe; I-Afrika; I-United States of America; I-Finland; IMalawi; izikole eziphakeme; amadivayisi eselula

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CHAPTER 1: ORIENTATION, BACKGROUND and CONTEXT

1.1. INTRODUCTION

The rapid evolvement of 'smart' technology and the internet age with its information explosion has created many opportunities for innovation in education. Mobile devices have become both individualized and collaborative tools that extend learning beyond the traditional classroom setting. It makes it possible for people to access educational materials "anyplace and anytime" (Motiwalla 2007: 583, 584).

Telecommunications providers are busy implementing broadband installations for homes in South Africa. Openserve, a wholesale division of Telkom is responsible for the optic fibre rollouts in Pretoria, Durban, Cape Town, Bloemfontein, Kimberley, Port Elizabeth, Bryanston and other suburbs of Johannesburg. According to Alphonzo Samuels (the Managing Director of Openserve in 2015) they aim to reach 1 million homes by the end of 2018 and 3 million by 2020 (Samuels 2015).

Other service providers offer new wireless technology options to clients such as LTE (Long –Term Evolution) (Hill 2018) and FTTP (Fibre-to-the-premises) (Wikipedia 2018a). These internet options allow users to browse the internet at a faster speed (Rouse 2018) and to download and use multimedia applications on their mobile devices and home networks. Solid, faster, cheaper and broader broadband will mean better global integration and competitiveness for South Africa (Business Tech 2017). Education can also be provided electronically to more students, faster, cheaper and more effectively. Other African students stand to benefit as well.

1.2.   THE SOUTH AFRICAN CONTEXT AND ENROLMENT RATES

South Africa's public education system includes both fee and non-fee paying schools, with approximately 65 % of learners attending non-fee paying schools (GHS 2015). Sayed and Motala (2012) explain that many learners of no-fee schools in South Africa receive low quality teaching.

In 2017 concern was raised by the public regarding the new Memorandum on the Objects of the Basic Education Laws Amendment Bill (DBE 2017d) which takes away the powers of school governing bodies to select learners for admission, appoint teachers and establish language policy in schools (eNCA 2017, Amendments to SA Schools Act 2017, Redelinghuys 2017). People were fearful that schools will simply be nationalised to become state institutions resulting in service delivery problems. Online tuition via mobile devices could provide a better alternative for improving the quality of education delivery and raise educational standards without running the risk of overcrowding schools. Students attending non-fee paying schools will have access to the online materials and content via a mobile device.

Govender (2016) reports on the education statistics for learners enrolled in the Further Education and Training (FET) phase in South Africa (Grades 10, 11 and 12 form part of the FET phase). The 2014 statistics report, which Govender reports on, was only released by the Department of Basic Education (DBE) in June 2016 (DBE 2016: 1-12). It shows that students enrolled in grades 10, 11 and 12 made up 20.6 % of the total school population and that **under-enrolment** was highest amongst grade 12 learners. Only 54.49 % of the respective appropriate school-age population was enrolled in grade 12. Many learners drop out before entering grade 12 (Govender 2016: 1). The DBE's website (*https://www.education.gov.za)* was consulted and the report retrieved to verify the statements made.

Tables *1a* and *1b* summarise the relevant data regarding learner enrolment as per the 2014 statistics report. It indicates that only 85.95% of learners who were

supposed to be in grade 11, were actually enrolled and nearly half of the learners who should be attending grade 12 were not enrolled in the grade at all.

Table 1a:

Learner enrolment in the FET phase as a percentage of the Total School Population

Total school population		# of learners in Gr 10	# of learners in Gr 11	# of learners in Gr 12		Total	FET phase enrolment as a % of the total school population
12 655 436		1 139 872	897 342	571 819		2 609 033	20.62%

Source: (DBE 2016: 9, 10)

Table 1b:

Enrolment and under-enrolment rates of Grade 11 and 12 learners

	Learner Population	# of Learners enrolled	Percentage Enrolment	Percentage under- enrolment
Gr 11	1 044 079	897 342	85.95%	14.05%
Gr 12	1 049 313	571 819	54.49%	45.51%

Source: (DBE 2016: 12)

According to the National Planning Commission's Executive summary of the National Development Plan (NDP) for 2030, issued in 2012, "the FET system is not effective. It is too small and the output quality is poor. The quality and relevance of courses need urgent attention." (NDP 2012: 40). Results displayed in the DBE's 2017 National Senior Certificate Diagnostic Examination Report Part 1 confirm these concerns. Only 51.9% of learners who wrote the National Senior Certificate (NSC) examinations passed Mathematics, 65.1% of learners who wrote Physical Science passed and 66.1% of learners who wrote Accounting Sciences passed (DBE 2017b: 9, 151, 175). Currently, learners only need to score 30% or 40% on their examinations in order to pass (DBE 2017b). This is not an

adequate indication that a learner has grasped the subject content or that he/she is able to apply it correctly. It gives further reason for the implementation of an online mobile tuition service that promotes subject mastery instead of lowering educational standards to accommodate struggling learners.

Khan (2015) shares the philosophy of teaching for mastery instead of test scores only. He explains that technology enables education to be more engaging for students who might have given up in a 'traditional' educational setting when the content is too difficult or the presentation thereof too monotonous. On-demand videos, real-time constructive feedback and adaptive practice exercises enable learners to take agency of their learning, build grit and cultivate a growth mind set for deeper learning. Video media can reinvent education continually (Khan 2011). For an e-learning system to be optimal, an educational database with high quality educational videos corresponding to specific FET curriculum topics should be maintained and updated regularly.

I found that the available research literature often focusses on Early Childhood Development (ECD) and very little seems to have been done for the FET phase with regards to e-learning innovation. Mobile phones and digital devices lend themselves much more to this phase than ECD, in my opinion, thus it is an appropriate medium for structuring and delivering innovative educational content pitched to the high school age group to "improve access of the youth to Further Education and Training beyond Grade 9" as per goal 13 of the DBE's 2019 Action Plan (DBE 2015: 3)

1.3.   SOUTH AFRICAN LEARNER PASS RATES

Table 2 gives a breakdown of learner pass and fail rates for Mathematics, Physical Science and Accounting for the NCS examinations written in 2017.

Table 2: Learner pass rates for Mathematics, Physical Science and Accounting NSC examinations in 2017

Subjects	Candidates that wrote the NCS in 2017	Candidates that passed the NSC (scoring 30% and above)	Pass Rate	Candidates that failed the NSC (scoring below 30%)	Fail Rate
Mathematics					
Male	107 620	62 415	58.00 %	45 205	42.00%
Female	137 483	64 782	47.01%	72 701	52.88%
Total	245 103	127 197	51.90%	117 906	48.10%
Physical Science					
Male	81 688	55 740	68.20%	25 948	31.76%
Female	97 873	61 122	62.50%	36 751	37.55%
Total	179 561	116 862	65.10%	62 699	34.92%
Accounting Sciences					
Total	103 427	68 318	66.10%	35 109	33.90%

Source: (DBE 2017b: 76, 97)

The decision of the Minister of Education to lower the maths pass mark to 20% for grades 7-9 (DBE 2016: 1, 2) is, in my opinion, also counterproductive. The learner receives a pass mark, but is not on a proficient level. A consequence of this is that education standards in the higher grades are forced downward to accommodate for weak learners. This negatively impacts teachers who must spend more time and energy re-teaching basic concepts as well as stronger learners who are held back and have to wait for weak learners to catch up. Students may receive a

university pass, but they then cannot cope with the workload and pace of a university level course. Universities are also challenged with larger student intakes each year and many learners with low proficiency levels.

Muller (2016) of the University of Cape Town explains that South African schools are pressured to "push" learners through "to avoid repeated student retention" (Muller 2016). She also mentions that Mathematics teachers are struggling and that primary teachers are trained as generalists, not subject specialists implicating a learning backlog already occurring in primary school which then becomes almost impossible to correct once a student reaches high school. This is another reason for developing an e-learning framework which can guide specialised online instruction for distribution on mobile devices.

1.4.   THE GLOBAL LEARNING CRISIS

South Africa is not the only country experiencing a learning crisis. Dr. Karboul (2017) draws attention to the global learning crisis occurring across the world today, where half of the world's children fail to learn because of unsupportive and unsafe learning environments. The United Nations Educational, Scientific and Cultural Organization's Global Monitoring Report (UNESCO 2014a) estimates the cost of this crisis amounts to approximately $129 billion per year.

According to the United Nations International Children's Emergency Fund's #ENDviolence in Schools Report (UNICEF 2018), half of the students between 13-15 years of age (approx.150 million learners) experience peer-to-peer violence around school and more than 1 in 3 students in the same age group are bullied or involved in physical fights globally (UNICEF 2018: 3). Oftentimes, victims of cyberbullying are also physically bullied. Cyberbullying is a term given for the digital dissemination of violent, hurtful and humiliating images and words via a digital device. Victims of cyberbullying are more likely to suffer from low self-esteem, health problems and use alcohol and drugs and skip school than other students. In extreme situations cyberbullying has resulted in suicide (UNICEF 2018: 9). E- and m-learning provides learners with an alternative and opportunity

to remove themselves from harmful situations while still being able to access learning materials.

Transparency International, a global, non-partisan movement published a Global Education Corruption Report (Transparency International 2013) which brings to light various instances of corruption in education occurring world-wide. In an e-learning environment, issues such as textbook procurement problems and teacher absenteeism can be prevented or reduced. UNESCO recommends that governments should ensure the best teachers reach the learners who need them most (UNESCO 2014a: 3). An online/m-learning system can provide such a service by making quality, expert online videos per curriculum topic available with appropriately set assessment tasks.

The Global Education Monitoring Report Summary 2017/8 suggests that the monitoring and evaluation of education should be systematized so that decisions informed by data can be made at national, subnational and school level (UNESCO 2017c: 15). The report also highlights challenges experienced when evaluating teachers for quality of instruction (UNESCO 2017c: 23). An online system can incorporate feedback/rating features for learners to give constructive, guided input after a lesson. It can also improve and simplify the collection, storage and analysis of learner and educator data based on learning outcomes.

1.5.   TEACHING AND LEARNING IN THE DIGITAL AGE

As pertaining to the teaching profession in South Africa, De Villiers (2017), reports on teacher migration. He recommends that more must be done to make teaching an attractive and stable profession in South Africa. Trained South African teachers are often lured overseas where they are able to earn more and receive better accommodation, health care and tax advice in host nations. Another pull factor mentioned by survey participants was that the methods of learner assessment were better in developed nations. There is both scope and opportunity to develop online tuition and assessment in South Africa to be on par with those of other overseas nations.

Blewett (2018) employed cyber-ethnography to investigate how students learn in the digital age. Students used a Facebook page as their primary learning portal. According to Blewett, Facebook provided five learning affordances to students (such as accessibility, connection, communication, control and construction). He proposes that learning must shift away from passive instruction (pure consumption of content by learners) to more active approaches such as curation, conversation, correction and creation. I agree with Blewett that technology can amplify great teaching, but contrary to him I think that an online m-learning system with quality instruction and content can help to alleviate and eventually eradicate poor teaching.

Developments and shifts in artificial intelligence will impact the global economy and African countries' economies and education sectors. As internet connectivity advances, South African education and curricula can be kept relevant and reach those students who need assistance the most, by going mobile/online.

Hamann (2018) forewarns developing countries to "wake up to the risk of new technologies (including artificial intelligence) that is associated with the fourth industrial revolution. He encourages governments to carefully assess the 3 major, interrelated risks of: worsening unemployment, increasing concentration of wealth and Artificial Intelligence (AI) algorithms with biases built into them. Governments need to evaluate these risks in their national context and establish appropriate policies and programs such as national skills development, work placement platforms, intellectual property and competition policies as well as local technology adaptation and development. The digital era brings about new opportunities and unique challenges in teaching and learning with key role changes, new responsibilities, a variety of expectations from stakeholders and ample opportunity for creative course design.

1.6. MOBILE AND INTERNET ACCESS FOR SOUTH AFRICANS

Statistics SA reports in the General Household Survey of 2015 (GHS) that "only 3.5%" of South African households did not have access to a landline or a cell phone in 2015. In contrast, "85.5% of households had access to at least one cellular phone" and "10.9% of households had access to both a landline and cellular phone" (GHS 2015: 54).

Table 3 is a condensed version of the statistical data found in the General Household Survey of 2015. The *first nine columns of the table relate to the percentage of the population by province* and *the final column gives the percentage of the whole country's population*. The two main variables measured in this study includes: **access to a cell phone** and **access to the internet**. Please refer to the key at the end of the table for full names of the abbreviated column headings.

The data shows that only 53.5% of the total population actually have internet access and that 47.6% of South Africans depend on their mobile device to gain internet access. There is both a need and plenty of opportunity for infrastructural development for easier internet access to more people.

Table 3: Percentage of the population with access to cellular phones and the internet by province.

	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Only Cell Phone	69.2	87.1	77.8	89.0	86.1	89.5	84.3	94.4	94.1	85.5
Cell phone & Land line	26.2	5.9	10.8	5.9	10.8	5.5	14.1	3.6	2.8	10.9
None	4.4	7.0	11.1	4.9	3.0	5.0	1.5	2.0	3.1	3.5

	WC	EC	NC	FS	KZN	NW	GP	MP	LP	RSA
Internet access at home	21.4	5.2	6.3	6.1	4.9	3.6	15.6	6.8	1.3	9.6
Internet access on mobile devices	53.6	41.9	46.4	47.1	36.2	45.1	57.1	53.2	36.3	47.6
Internet access anywhere	63.3	46.0	49.0	50.8	42.3	47.5	65.7	55.7	39.3	53.5

Key : WC – Western Cape; EC – Eastern Cape; NC – Northern Cape; FS- Free State; KZN- Kwa-Zulu Natal; NW – North West; GP – Gauteng Province; MP- Mpumalanga Province; LP – Limpopo Province; RSA – Republic of South Africa

Source: (GHS 2015: 55, 56, 57)

By creating a framework for instructional design for mobile devices it is possible to reach much larger numbers of students and give them access to expert knowledge and expertise in specific subjects such as Accounting, Mathematics and Science via their mobile phone. Quality cognitive content becomes accessible if the learning program is intuitive and user-friendly enough. Students who aren't currently enrolled at a school can be reached and teachers and school institutions can use this framework to develop well-structured supplementary courses or revision courses to enhance and improve learning outcomes in the diverse South African context specifically.

1.7. PROBLEM FORMULATION

As yet, South Africa does not have a national framework for instructional design for mobile devices. A gap exists in South African and African research literature

pertaining to m-learning and e-learning in the high school phase. I am also unaware of any other countries where e-learning frameworks have been implemented nationally.

If one considers the new developments planned in terms of broadband rollouts for South Africa then it is both progressive and practical to develop such a framework. According to the enrolment and under-enrolment statistics discussed earlier there are hundreds of thousands of students in South Africa who are under-exposed educationally, without access to quality education and who can benefit from such a framework and e-learning option. The purpose of this research is to design an e-learning framework for learners in the FET phase. This framework could potentially be made available to and implemented in other African countries, to help advance and structure online education for learners.

1.8. RESEARCH QUESTIONS

The main research question is structured as follows:

What does an effective e-learning framework to benefit South African and African learners in grades 10, 11 and 12 consist of?

Each sub-question below relates to this question and must also be addressed. Results and research conclusions can then be applied to design an e-learning framework for mobile devices aimed at high school learners in grades 10 to 12. The sub-questions are as follows:

1.8.1. What e-learning and m-learning frameworks supported by relevant educational theory and pedagogical principles have already been developed?

1.8.2. How does current South African educational legislation and policy enable/ support e-learning?

1.8.3. How is education structured, regulated and managed in other first and third world countries to enable e-learning and what developments in e-learning have taken place?

1.8.4. Which specific elements must be included in an effective e-learning framework for instructional design for mobile devices to benefit learners in South Africa and Africa?

1.9. AIMS OF THE RESEARCH

The overall aim of this study is:

To develop an effective e-learning framework for instructional design for mobile devices that can be implemented for the benefit of South African (and other African) learners in grades 10 to 12.

Corresponding sub-aims that correspond with the above stated sub-questions are listed below:

Aim 1: to evaluate existing frameworks for e-learning and illustrating a proposed e-learning framework for the South African context.

Aim 2: to investigate different learning theories and pedagogical principles and selecting those which the framework will be based upon.

Aim 3: to evaluate current South African education legislation and policy with respect to the proposed e-learning framework.

Aim 4: to conduct a study of education systems and e-learning developments in other first and third world countries.

Aim 5:   to propose an e-learning framework for instructional design for mobile devices for learners in the FET phase in South Africa and Africa.

1.10. RESEARCH DESIGN AND METHODS

This study draws from three major theoretical traditions, namely: critical theory, interpretivism and constructivism. These traditions exist in relationship to each other, with unique assumptions and purposes which are addressed in detail in Chapter 4, Sections 4.5. and 4.6.

To achieve the objective of this study, i.e. proposing an e-learning framework for mobile devices, it makes sense to approach the study interpretively and critically to create room for differentiating between meanings and making effective comparisons. Constructivism applies here as new data and reasoning is constructed with regards to instructional design for mobile devices

The research will be qualitative in nature, incorporating document analysis (Bowen 2009) and analysis of TED (Technology, Entertainment and Design) videos, You Tube videos and audio content. The research procedure entails selecting and interpreting existing data (academic publications, statistical results, policy documents, newspaper articles, videos and radio talk shows) critically and evaluatively. Selected data and newly generated data will be added to an archive (Rapley 2007b: 10).

The literature review is approached critically to establish relevance, truthfulness and current-ness of data. By evaluating and comparing education policy and strategy of first and third world countries, relevant recommendations for South Africa and Africa can be made.

1.11. ETHICAL MEASURES

This study only involves the researcher and selected data sources. The research design poses no risk to people, animals or the environment. No human participants were involved and no interviews or surveys were conducted or distributed. The UNISA Policy on Research Ethics (2016) was adhered to. References were fully cited and ethical clearance was obtained from UNISA's College of Education (Appendix A).

1.12. TRUSTWORTHINESS

In order for research to be trustworthy, the data and information presented must be credible, transferable, dependable and confirmable (Devault 2018). These four concepts will be elaborated upon in Chapter 3. Data from credible sources ensure that findings are dependable. Complete references are provided for verification and confirmation of data.

1. 13. CLARIFICATION OF CONCEPTS

In order to clarify the problem and purpose of this study, the following key concepts are defined:

Assessment Standard:

An assessment standard "describes the minimum level, depth and breadth of what is to be learnt" (DBE 2002: 23) (learners' proficiency in each learning outcome). It is "grade specific" and indicates the "conceptual progression" that occurs in a learning area (DBE 2002: 23).

E-Learning:

Instruction delivered digitally that is intended to educate or support learning (Clark & Mayer 2016). Instruction can be instructor-led (synchronous learning) or designed for self-paced individual study (asynchronous) (Kolagani 2016). Media such as words, pictures, video and audio are employed to deliver the content. Lessons are stored and transmitted from the cloud or servers on the internet (Clark & Mayer 2016: 7, 8).

E-learning System:

E-learning is defined above. An e-learning system is a software-based teaching and training system (Stankov, Glavine & Rosic 2011) that runs/functions on a computer or digital device and includes tele-teaching, virtual classrooms and learning-management systems.

FET phase:

The Further Education and Training Phase in the South African education system which consists of grades 10 -12.

Instructional Design (ID):

Instructional design entails the systematic process of planning events to facilitate learning (Chen 2011: 80). According to Merrill, Drake, Lacy, Pratt & the ID_2 Research Group (1966) "ID is a technology for the development of learning experiences and environments which promote the acquisition of knowledge and skill by students." It "incorporates known and verified learning strategies into instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing" (Merrill et al.1966: 6).

Instructional Systems Design (ISD):

The development of an e-learning system falls under Instructional Systems Design. ISD is a "systematic process for the assessment and development of training solutions, designed specifically for the purpose of formal training delivery" (Training Industry 2017). The objective of ISD is to convert content and learning tasks into digital instructional materials and information resources by applying relevant learning theories and assessment methods to enhance knowledge acquisition and skills of participants according to specific educational outcomes (Instructional Design Central 2018).

Learning Outcome:

A description of the specific knowledge, skills and values (DBE 2002: 23) that learners should be able to demonstrate, apply and understand/know at the end of a lesson/topic.

Micro-Content:

Educational content that is focused, self-contained, indivisible, structured and addressable (Leene 2006: 5, 6). A variety of multimedia is integrated in short form as text, video and audio with high levels of interaction.

Micro-Learning:

Learning content is presented in smaller digestible "chunks" (micro-content) and displayed as steps. This makes learning faster and more effective. It is useful for "quickly closing skill and knowledge gaps" (Malamed 2017) and it can be applied very successfully for "learning languages or topics that require repetition" and "learning software applications" (Malamed 2017). By incorporating micro-content into course design for distribution on mobile applications learning can become more efficient and effective by presenting educational content in step-by-step micro-units to learners.

M-Learning:

M-Learning is an abbreviated form of the term Mobile learning. It is a form of e-learning that takes place through a mobile device as communication medium. Personal mobile devices (such as smart phones and tablets) are used to download educative materials from mobile applications, social media and online educational hubs. It allows students flexible access to education anytime, anywhere. "People can use mobile devices to access educational resources, connect with others, or create content, both inside and outside classrooms" (UNESCO 2017b: 1).

Mobile application for education:

A software application that runs and functions on a mobile device such as a smartphone or tablet (Rouse 2013). Educational materials, micro- course content and assessments are administered and delivered by this application and delivered through this application to users via their mobile devices.

1.14. CHAPTER OUTLINE

This section serves to provide the reader with descriptions of main concepts presented in each chapter of this study.

Chapter 1:

The first chapter gives perspective on current developments in South African online education as well as infrastructural advancements made and further challenges that the country faces educationally. It is clear from the statistical data that online education can fill a gap to improve current educational standards in South Africa. The research problem, questions and aims are formulated and followed by a short discussion on the research approach and research methods to

be employed. A list of relevant terms and concepts from the literature with definitions is also provided.

Chapter 2:

This chapter contains the literature review with analysis and evaluation of existing e-learning frameworks. Unique characteristics of each framework are highlighted and specific elements most effective for adaptation and use in an e-learning framework for South Africa and Africa is indicated.

Chapter 3:

In Chapter 3, the learning theories most appropriate for an e-learning/m-learning environment are selected and discussed by considering their pedagogical implications in a mobile learning environment.

Chapter 4:

Chapter 4 elaborates on the research design and methodology. Constructivism, interpretivism and critical theory are selected as applicable research paradigms. Data collection and analysis techniques are discussed to ensure trustworthiness (including credibility, transferability, dependability and confirmability) and the ethical issues applicable to this study are also addressed.

Chapter 5:

In Chapter 5 a descriptive analysis of applicable South African education policies, white papers and legislation is conducted. This chapter also looks at how other first and third world countries abroad have structured education and implemented e-learning, so that South Africa need not repeat past mistakes, but rather adapt successful strategies to achieve positive results.

Chapter 6:

In this chapter, the proposed e-learning framework is introduced and illustrated with detailed explanations. A summary of research findings is provided along with recommendations for the Department of Education, teachers and researchers for further study in this field.

1. 15. CONCLUSION

Chapter 1 sets the stage and motivates for the development of an e-learning framework for mobile devices in Africa. Current political and educational issues in South Africa and the world were highlighted with supportive statistical data. This data substantiates the need for alternative ways of delivering quality education to learners in the FET phase, especially in South Africa. The research problem and questions were formulated to direct this study towards achieving the research aims and the research design and methodology were explained. Applicable ethical issues were also considered and complete definitions for key terms were provided.

Chapter 2 presents an in-depth literature review and tabular summary of existing e-learning frameworks with unique characteristics.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

Chapter 1 gave an overview of progress made with regards to mobile education in South Africa and the potential for further growth. Planned infrastructural developments, future broadband rollouts and statistical data indicate that an e-learning system can help lift educational standards and reach more students via their mobile devices thus improving enrolment and helping to raise pass rates.

Chapter 2 is a literature review investigating 7 e-learning and m-learning frameworks designed by other scholars. Each framework categorises and explains various interrelated elements involved in e-learning systems and processes. By analysing how each framework co-ordinates the different aspects of e-learning, I aim to delineate main applicable features of each for incorporation into a proposed e-learning framework for the FET phase for the South African and African context.

2.2. LITERATURE REVIEW

The goal of a literature review is to review major published works in the researcher's area of interest, to identify what is already known about the research problem (Terrel 2016: 46). It helps to clarify theoretical perspectives on the research problem. Hemsley-Brown and Sharp (2003: 450) describe a systematic approach to literature review. Research questions are addressed by conducting exhaustive searches and establishing criteria to evaluate the quality of available literature sources for inclusion or exclusion from the review. I follow and implement the systematic approach.

The evaluative criteria that I used function as filters (Cronje 2008: 78) for selecting the best literature available on e-learning and m-learning frameworks. These criteria stipulate that information must be: (1) Current -- the material must be a

relatively up-to-date contribution to the field, (2) Relevant -- only frameworks that apply to e-learning or m-learning environments are included and (3) The author of the proposed text should be referred to by another reputable authority (Cronje 2008).

Because I could not establish a clear distinction in the literature between an "e-learning framework" and an "e-learning model" I decided to use the denotative meaning of the two terms as given by the *Oxford Paperback Dictionary* (2001: 356, 574):

> Framework – supporting or underlying structure
> Model – a particular version of a product which can be imitated

Some scholars use the terms interchangeably. Engelbrecht (2003: 1) explains that "e-learning models are attempts to develop frameworks". In this regard my opinion is that one should first have an overall framework before developing a model. This is illustrated in Khan's global e-learning framework with its accompanying P3 model (Khan 2004: 34). Most scholars do agree that an effective e-learning framework must be supported by relevant education theory (Park 2011: 1). Kuchi, Gardner and Tipton (2003: 3) explain that an e-learning framework should provide "overall parameters, conditions and support for various learning and teaching styles, information seeking behaviours and multiple intelligence approaches to learning in any type of classroom or online environment."

As pertaining to this study, I view an 'e-learning' framework as an overarching structure that guides the planning and thinking surrounding instructional design (ID) for mobile devices. It broadly identifies and compartmentalizes key elements in an online/mobile instruction environment (such as the technology, the participants involved, the organisational infrastructure required and learning programmes/activities and content to be delivered). All these aspects must be coordinated and managed in such a way that effective learning can take place.

On the pages following, I present a summarised overview of 7 existing e-learning frameworks:

1) Global E-learning Framework,

2) M-COPE Framework,

3) Pedagogical Framework for Mobile Learning,

4) SECTIONS Framework,

5) Mobile CSCL Framework,

6) M-Learning Framework,

7) Pedagogical Framework for an E-learning System

These frameworks are included in the literature review, because they apply to e-learning or m-learning environments directly. I decided to include frameworks designed after 2000 only as they are current. These frameworks are also referred to in the academic publications and dissertations of other scholars. I hope to adapt some of the characteristics of these frameworks for incorporation into a proposed e-learning framework for mobile devices in Africa.

2.2.1. THE GLOBAL E-LEARNING FRAMEWORK BY KHAN (2001)

Introduction

Figure 1: The 8 dimensional e-learning framework (Khan 2001)
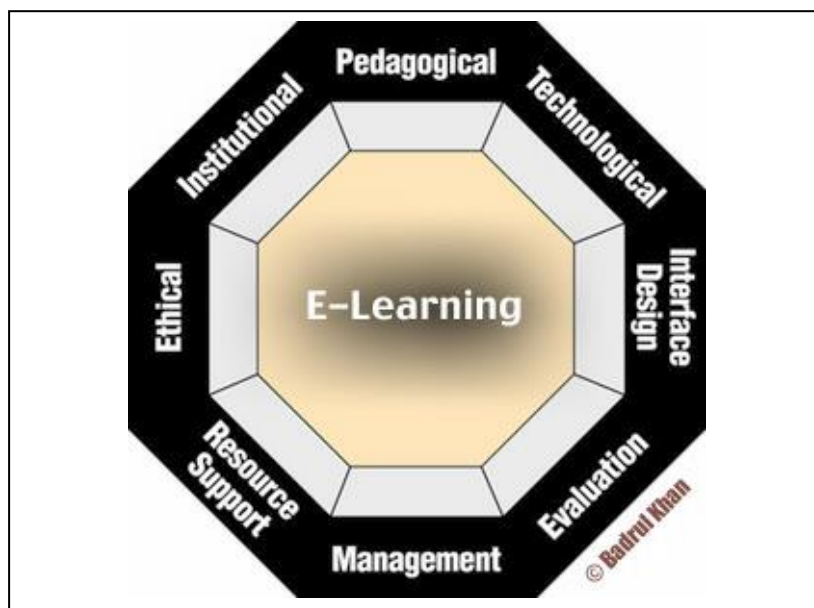
(Source: Mishra, S., Ed. E-Learning IGNOU STRIDE Handbook 8. 2009: 45).

As seen in the previous diagram, the global e-learning framework emphasises eight dimensions to create an open environment for learners from diverse backgrounds. The table below identifies specific sub-dimensions pertaining to these eight main dimensions.

Table 4: Dimensions and sub-dimensions of the Global e-learning framework

Dimension	Sub-dimensions
Institutional	Administrative Affairs, Academic Affairs, Student Services
Pedagogical	Content Analysis, Audience Analysis, Goal Analysis, Design Approach, Instructional Strategies, Organization, Blending Strategies
Technological	Infrastructure Planning, Hardware, Software
Interface Design	Page and Site Design, Content Design, Navigation, Accessibility, Usability Testing
Evaluation	Evaluation of Content Development Process, Evaluation of E-Learning Environment, Evaluation of E-Leaning at the Program and Institutional Levels, Assessment of Learners
Management	People, Process and Product (P3) Continuum, Management Team, Managing E-Learning Content Development, Managing E-Learning Environment
Resource Support	Online Support, Resources
Ethical	Social and Cultural Diversity, Bias and Political Issues, Geographical Diversity, Learner Diversity, Digital Divide, Etiquette, Legal Issues

(Source: Mishra, S., Ed. E-Learning IGNOU STRIDE Handbook 8. 2009: 46)

The Potential for Massive Open Online Course Design and Delivery

This framework can also be applied to MOOCs (Massive Open Online Courses), because each sub-dimension identifies a necessary aspect of an e-learning system and the e-learning process. It can be used to ensure that no important factor is omitted from the design of e-learning, no matter the scope or complexity (Mishra 2009: 49). For each sub-dimension Khan has developed comprehensive short checklists dealing with issues such as: a needs assessment, a financial readiness, technology readiness, infrastructure readiness and content readiness checklist, an academic and course schedule, a graduation checklist and an audience analysis checklist. These all appear in his book: *E-learning Quick Checklists* (Khan 2005). Using these checklists is pro-active and practical for planning, implementing and evaluating an e-learning system because they guide the developers' and managers' thinking. The checklists detail all the important elements to be accounted for and can be 'ticked-off' upon completion. This enables managers and developers to keep track of progress made and help to ensure that the e-learning system is successfully implemented and administered.

Khan (Mishra 2009: 44, 45) states that e-learning should be worthwhile to **all** stakeholder groups and that it entails a paradigm-shift for everyone involved. Instruction and learning need no longer take place in a traditional "closed" and controlled, "face-to-face" classroom environment. Koller (2012) explains that MOOC's can help address the 'desperately necessary' aspects of accessibility and affordability of education and promote the move away from a one-size-fits-all model towards a more personalized curriculum. Koller (2012) also highlights that a mastery-based approach to learning/teaching produced one full standard deviation (one sigma) better achievement scores than standard lecture-based classes, however one-on-one individual tutoring doubled the improvement in academic performance (2 sigma) and remains the most successful method of instruction. Koller (2012) suggests that a computer/smart-phone can fulfil the role of an individual tutor for learners. M-learning systems and technology enables more effective collection of learner-specific and learner-interaction data per student per

class for analysis. This can help to improve education delivery and services offered to students (Norvig 2012).

Walters (2014) mentions an important critique of MOOCs, which is the fact that the average completion rate of courses remain relatively low and dropout/failure rates high. I think that because the materials are offered for free, people do not feel obligated to complete a course if it becomes too difficult or time consuming.

Because the program designer relinquishes a certain amount of control to the user, management and administration of an open learning environment can become more complex as the open environment expands. Support systems must be available to prevent learner isolation and eventual drop out. Khan's framework provides a way or at least an opportunity to raise the bar with regards to educational delivery, accessibility, learner enrolment and academic performance in South Africa.

Evaluation and Synthesis

In his article "Who killed e-learning?" Cronje (2006: 1, 2) opines that e-learning is just another buzz-word that has lost popularity in favour of others. He describes Khan's framework as a 'coffin' (Cronje 2006: 3). I, on the other hand, do not agree that e-learning is dead. E-learning hasn't really taken off in South Africa yet and it is already more than 10 years since this article was written. There is both scope and potential for e-learning to be realised in South Africa and Africa. I agree with Cronje (2006: 9) that technology should not be the driving force behind learning, but that learning should be its own driving force. You can't force a learner to learn something they don't enjoy or value, they must be inspired and want to learn. Technology can help stimulate, organise, facilitate and deliver education much more effectively than is currently taking place in many schools in South Africa and Africa. This can make learning more time effective, enjoyable and purposeful for learners.

Kurt and Şimşek (2016) use Khan's 8 dimensional global e-learning framework to evaluate mobile learning. They concur that an e-learning framework is meaningful to learners when it is easily accessible, clearly organized, concise and well written, authoritatively presented, learner-centred, affordable, efficient, flexible, and has a facilitated learning environment (Kurt and Şimşek 2016: 105-107). Khan (2005: 10-12) presents 6 e-learning features with corresponding components conducive to learning namely: ease of use, interactivity, multiple expertise and collaborative learning. The more components an e-learning program integrates meaningfully, the more learning features it will be able to offer. Basic components corresponding to ease of use for example, includes: a common user interface, search engines and browsers, hyperlinks and a standard point and click navigation system.

2.2.2. THE M-COPE FRAMEWORK BY DENNEN AND HAO (2014)

Introduction

The M-COPE framework encourages instructors to include five essential aspects: mobile affordances, conditions, outcomes, pedagogy and ethics (Dennen & Hao 2014: 397). Mobile affordances imply that educators must consider their reasons for choosing mobile education. When considering South Africa's education situation as discussed in Section 1.3 of Chapter 1, mobile education can add value by assisting learners to be more productive and they can at least progress without being limited by poor physical school circumstances.

Nursey-Bray (2015: 741-742) emphasises the importance of moving with the times to build effective curricula using mobile technologies. The M-COPE framework is a tool for assisting educators with effectively integrating mobile learning so that teaching practice can become more versatile (Nursey-Bray 2015: 749). Dennen and Hao (2014: 408) lay out a flow chart for establishing whether mobile learning would be suitable for a specific educative activity. Below is an adapted chart including all original steps.

Figure 2: Flowchart for using M-COPE to establish mobile learning suitability
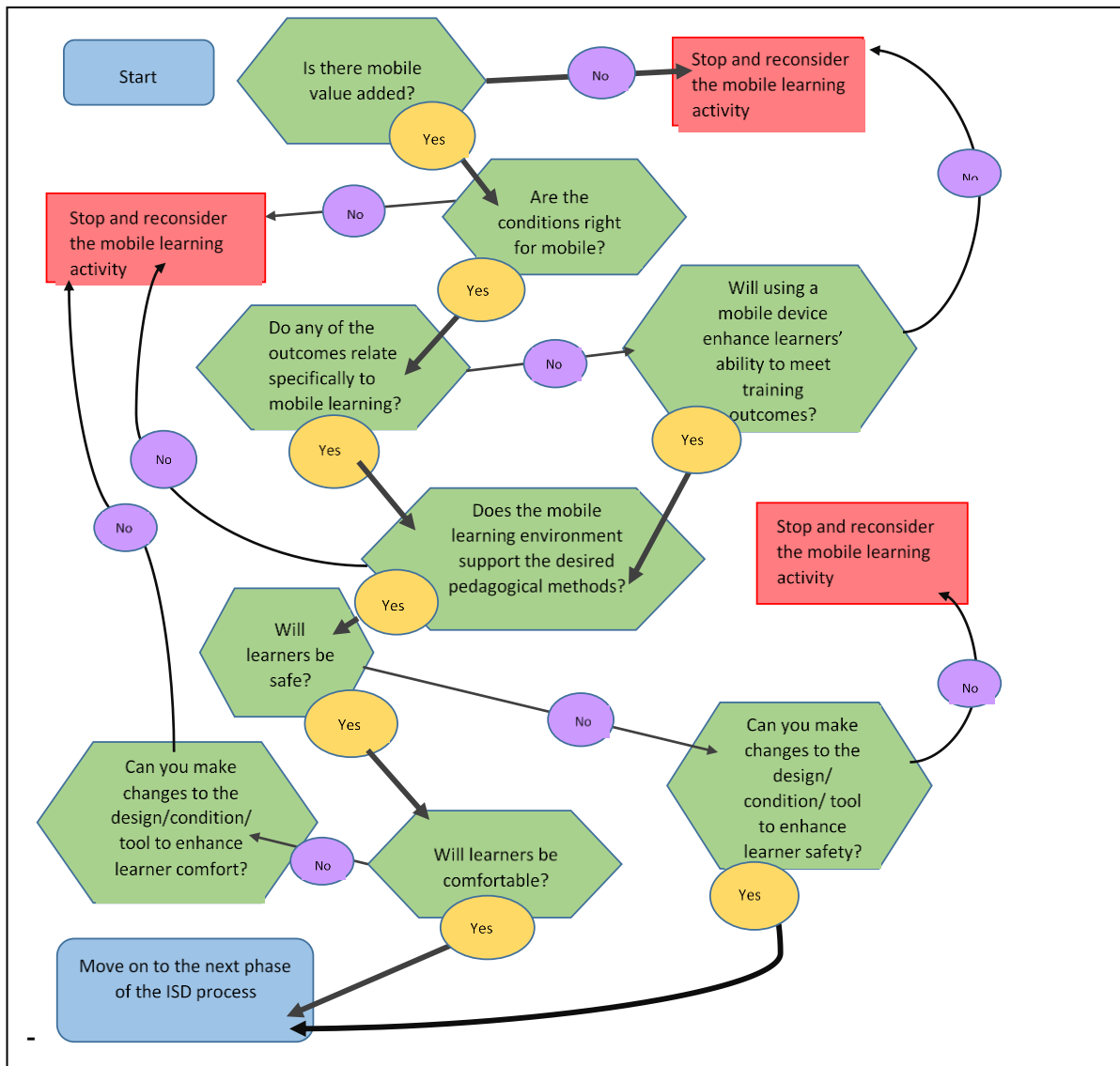
The M-COPE Framework and Instructional Systems Design

The M-COPE framework can be integrated into instructional systems design (ISD) processes by using the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model. Currently more than 100 different ISD models exist of which the majority is based on the ADDIE model (Chen 2011: 80) The ADDIE model is widely accepted as a generic representation of the ISD process (Chen 2011: 81). An illustration (Figure 3) of the main elements of the ADDIE model follows on the next page.

Figure 3: The ADDIE model
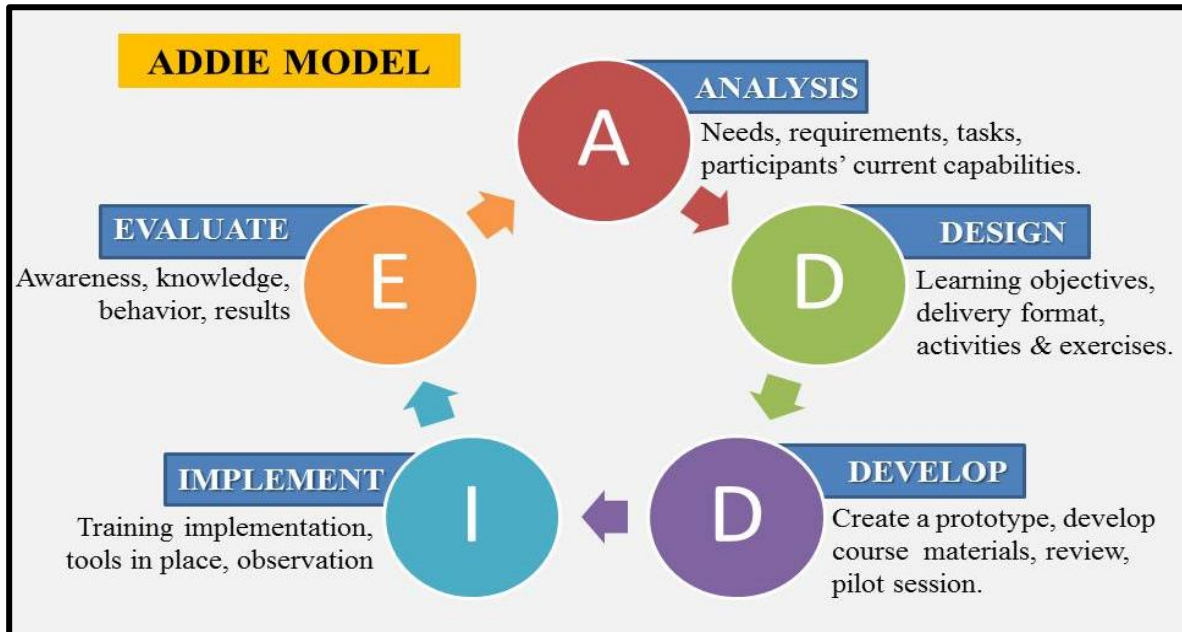
(Source: Penney 2016)

Dennen and Hao (2014: 409-411) formulated appropriate prompting questions for each phase in the ADDIE model to assist designers and educators with ISD processes. Each question also relates to a specific topic of the M-COPE framework (Mobile, Conditions, Outcomes, Pedagogy and Ethics Framework). Table 5 is a summative table of the M-COPE framework with corresponding prompting questions.

Table 5: M-COPE prompting questions for each phase in the ADDIE model

Phase	Topic	Questions
ANALYSIS	Mobile	What mobile tools/applications are available to enable learning interactions?
	Conditions	What are learners' prior experiences with and attitudes toward mobile devices/learning?
	Outcomes	Which learning objectives relate to mobile learning?

	Pedagogy	Why does the educator believe a mobile activity can support learning in this context?	
	Ethics	Will learners have to be trained in mobile device usage and will this take away from the learning experience? What are the internet safety and digital footprint concerns when working with a specific learner group?	
DESIGN	**Mobile**	What existing tools, mobile apps and resources can be used in this activity?	
	Conditions	Will learners need their own devices? Who will supply the devices? Where and when does the activity take place?	
	Outcomes	How will the mobile device enable learners to meet learning outcomes?	
	Pedagogy	In which ways can a mobile device enhance the desired instructional methods and approaches?	
	Ethics	If learners bring their own devices, might anyone be left out?	
DEVELOPMENT	**Mobile**	Is all of the required mobile functionality achievable?	
	Conditions	Do the mobile resources function across platforms and other devices?	
	Outcomes	Is the activity aligned with learning outcomes? Is any technology being used that does not relate to an intended outcome?	
	Pedagogy	Are there any conflicts between the desired teaching methods/approaches and mobile functionality?	
	Ethics	Is the mobile tool/device easy to use and secure?	
IMPLEMENTATION	**Mobile**	Must the devices be prepared (updated, apps installed) for the lesson?	
	Conditions	Is internet connection and speed sufficient for the activity? Are enough devices available and accessible for learners?	
	Outcomes	What learning support is needed ensure the realisation of learning outcomes?	

	Pedagogy	How can mobile interactions be facilitated? What must educators do to ensure that learning takes place?
	Ethics	Are learners leaving behind any digital footprints? Who can access these footprints and how? For what purposes?
EVALUATION	Mobile	Can evaluation data be collected automatically through mobile tools? Did the device and applications function as expected?
	Conditions	What were learner attitudes toward the devices? How was learning supported through the devices?
	Outcomes	Were the desired learning outcomes achieved? Were there any additional unexpected outcomes?
	Pedagogy	Did the mobile device enhance or diminish the learning experience?
	Ethics	Were participants overwhelmed or uncomfortable when using the technology?

Ethical Implications

Dennen and Hao (2014: 406) direct attention to ethics which is a crucial aspect of e-learning as per the M-COPE Framework. Being an ethical instructor requires thoughtful judgement and guidelines must be provided for student interactions via the technology. Other important aspects include the ownership of educational products and content (such as archived conversations and social media commentaries). Student- and teacher- created content authorship must be addressed.

Ignorance about safety issues and the device's capability can be overcome by instructing users about the functionalities of the device and demonstrating how to use it correctly. Device ownership (Dennen & Hao 2014: 407) is another potential problem as learners may become frustrated with older and slower devices or when they have to share a device because they are unable to download an application successfully. Most mobile activities require a user account to be set up which

creates a digital footprint and access and use by third parties of personal data have become a serious concern for many people.

Bušíková and Melicheríková (2013: 435) investigated ethical problems occurring in e-learning and distance education institutions. They suggest that the "psychological distance" experienced by online learning participants is a major obstacle. People tend to break the rules when using information technology, because the act feels less personal as the person on the other side cannot be seen or heard (thus there is no immediate reaction or consequence in response to any misconduct performed). Gearhart (2001) emphasises the importance of understanding what leads to cheating. Learners can be pressured for good grades and not possess a full understanding of academic regulations. The testing environment may be organised and administered poorly, creating loopholes for cheating. The personality traits of learners and/or supervisors could compel the individual to commit offense and rationalise the misconduct. Moral reasoning could be lacking or underdeveloped in certain individuals due to their backgrounds and upbringing.

Fass (1990) categorised academic fraud in an e-learning environment. The issues directly applicable to this study are the following: inappropriate tutoring, misrepresentation in the collection and reporting of data, improper use of academic resources, disrespecting the work of others, breaches of computer ethics, lack of adherence to copyright and copy-protection, providing inappropriate assistance to others and lack of adherence to academic regulations. Aubusson, Schuck and Burden (2009) identified similar ethical concerns when introducing m-learning into the classroom such as: the potential dissemination of information originally intended for a limited audience, the risk of unethical use of archived materials and the ease and speed at which digital materials can be shared as compared to other non-digital artefacts. Bušíková and Melicheríková (2013: 437) studied the most common e-learning ethical misconduct witnessed in Slovakia. Students paraphrased incorrectly in homework, on discussion boards and in research papers. They gave their usernames and passwords to third persons and obtained paid writing assistance of outside parties. When online tests were administered, students browsed the internet for the correct answer or provided an

outside party with their personal login details to sit for the test or examination on their behalf. Exam proctors could be unreliable and compromise the examination if they are personally acquainted with international students.

Blumenfield (2011: 293-297) mentions other issues present in online environments such as cyberbullying, phishing scams, trolling and griefing. Phishing is a criminal, deceptive activity implemented to lure an unsuspecting individual into divulging sensitive financial information such as computer passwords, credit card numbers and bank account details. This is often done by way of an email or text message disguised as a legitimate and reputable person or institution that directs the reader to a counterfeit website where they need to 'verify' account details or billing information. An online 'troll' is someone who posts controversial, off-track and disruptive messages in response to a valid question in order to either confuse, provoke or offend the group, while a 'griefer' mainly targets online virtual gaming communities and intends to inflame and disrupt gamers.

Adebowale (2011: 315-321) discusses internet users' rights violations. Intellectual property theft and copyright infringement, internet fraud, email abuse, the violation of digital watermarking protection, personal misrepresentation, website visitor harassment, privacy and censorship, and cyber stalking all impose on an individual's or institution's user rights when using the internet. Digital watermarking (Adebowale 2011: 317, 318) is the procedure whereby identifying data is woven into media content (images, movies, music, programming etc.) to give it a unique digital identity. It is unnoticeable to the human eyes/ears, but can easily be picked up by software detectors. The data bits are scattered throughout the media file such that they cannot be manipulated or changed through encryption, decryption, editing, compression or decompression. Digital watermarking differs from encryption in that encryption is similar to 'locking' content in a safe to protect it from high-speed digital copying, but watermarking is similar to continuously labelling (burning) invisible identification and security copy protection onto the content so that it is embedded in the content and remains fixed while the content is being viewed, displayed, played or printed. Zhao and Luo (1999) specify 3 types of digital watermarks:

(1)   Copyright watermarks (specifying the copyright owner and/or authorised user)

(2)   Security watermarks (containing encoded security policies, place of storage, time range and the confidential rank of the document)

(3)   Active watermarks (the content owner has a control in order to respond to any detected violation of copyright/security policy)

Opportunities for unethical behaviour will have to be anticipated and addressed during the planning, design and implementation stages of an e-learning system for Africa. As mentioned previously, the main aim of my proposed e-learning framework is to give more students access and exposure to quality teaching and learning. All lessons, simulations and video demonstrations will be pre-recorded and available on demand. Assessments will mostly consist of multiple choice questions with an automatic memorandum and feedback. The digital educational products and any 'gamified' practice exercises will have to be digitally watermarked before online distribution. Learners will still be obligated to register and write government administered examinations at formal institutions as no official examinations will be administered on the online system as yet. Learners will not be able to submit any written tasks either. Ethical concerns regarding examinations and inappropriate writing assistance therefore does not apply yet, but I will keep all in mind for the future.

Gearhart (2001) suggests that a distance institution can manage ethical issues by setting a policy as model for students to follow and by incorporating technology ethics into the curriculum. Policy should also address: posting confidential material outside the institution, reposting messages without permission and disrupting/ interfering with network activities by distributing unsolicited advertisements and propagating computer viruses/worms.

The Association for Computing Machinery developed a Code of Ethics describing 8 general moral imperatives (Toprak, Özkanal, Aydin & Kaya 2010: 79) namely: contributing to society and human well-being, avoiding harm to others, being honest and trustworthy, being fair and taking action not to discriminate. Honouring property rights (copyrights and patents), giving proper credit for intellectual

property, respecting the privacy of others and honouring confidentiality. Again, these matters are not equally important for the purposes of this study, but I do take note of all of them.

Evaluation and Synthesis

Dennen and Hao's (2014) flow chart for confirming mobile suitability and the prompting questions corresponding to each ADDIE phase and topic of the M-COPE framework are effective, practical and pro-active to guide the planning and thinking that must precede any mobile instruction activity. By considering learners' safety, comfort, prior and current experiences and attitudes toward mobile devices, the educator ensures productive m-learning. Thus, the M-COPE prompting questions picks up where the adult perspective in the Dennen and Hao (2014) flow chart left off and taps into the child perspective, establishing sound pedagogy.

Park's (2011) pedagogical framework for mobile learning categorises different degrees of transactional distance (including psychological distance) experienced when performing mobile learning activities into four groups/types. These classifications and descriptions can assist with identifying and managing specific ethical matters pertaining to the activity.

2.2.3. THE PEDAGOGICAL FRAMEWORK FOR MOBILE LEARNING BY PARK (2011)

Introduction and Transactional Distance Theory

Park (2011: 1) adapts and uses transactional distance theory as a relevant theoretical framework for mobile learning in distance education. Transactional distance theory implies a geographical (spatial) separation between instructors and students as well as a psychological separation (pedagogic aspect). Moore (1973, 1983) originally developed transactional distance theory. Moore (1993: 23)

defines transactional distance as "a psychological and communication space to be crossed, a space of potential misunderstandings between the inputs of the instructor and those of the learner". Distance in education (Moore 2013) is affected by three variables or 'macro-factors' namely: **dialogue, structure and autonomy** (Saba 2014).

Dialogue refers to the responsive, positive interactions between teachers and learners. A dialogue is purposeful, constructive and valued by each party and directed towards improved student understanding. The parties are respectful, active listeners and contributors that build on the contributions of the other party/parties (Moore 1993: 24). The degree of learner and teacher responsiveness is determined by the subject matter (content) being studied, the educator's educational philosophy, the personalities of the educator and the learner, environmental factors and the medium of communication (Moore 1983: 157).

Structure mirrors the course design and is largely a function of the teaching organisation and communications media implemented (Garrison 2000). It reflects the rigidity or flexibility of the educational objectives, teaching strategies and evaluation methods. It also describes the extent to which individual learner needs can be accommodated (Moore1993: 26).

Autonomy refers to the extent to which learners determine "what to learn, how to learn and how much to learn" (Moore 2013: 68). Autonomy corresponds with the personality characteristic of self-directedness (taking personal responsibility).The greater the transactional distance the more responsibility is placed on the learner (Garrison 2000).

Moore proposed two types of autonomy: emotional and instrumental. Instrumental independence is the ability to undertake an activity such as learning without seeking help (Saba 2014). Emotional autonomy entails being capable of pursuing the activity without seeking reassurance, affection or approval in order to complete it (Saba 2014). In effect it is the learner's own self-approval (Moore 2013: 162) that drives him/her to complete a task.

A learner characteristic that complements emotional autonomy is grit. Duckworth (2013) compares grit to having stamina, passion and perseverance for very long-term goals. She observes that talent does not make a student gritty, but that grit is usually unrelated or inversely related to measures of talent. Dweck (2014) identifies two mind-sets that influence a learner's approach to learning and grit (namely a fixed mind-set or a growth mind-set). A fixed mind-set creates urgency amongst learners to prove themselves constantly. As a consequence learners become anxious and supersensitive about being wrong or making mistakes. There's a constant need for outside approval and confirmation of a learner's intelligence, personality or character. Learners tend to see 'failures' and negative events that happen as a direct measure of their competence and worth (Dweck 2006).

A growth mind-set on the other hand, is based on the belief that an individual's basic qualities can be cultivated through personal efforts. A person's true potential is unknowable and no one can foresee what someone can accomplish with years of passion, toil and training. Even when depressed, people with a growth mind-set take action to confront their problems (Dweck 2006).

The concepts of self-directed learning (SDL) and self-regulated learning (SRL) also corresponds to learner autonomy. Learners determine and make sense of their own learning (Pilling-Cormick 2011). In SDL, learners establish their priorities and choose from various resources available. They are actively involved in developing a system of meanings to interpret events, ideas or circumstances (Pilling-Cormick 1996). SRL is an active and constructive process whereby learners set goals for their learning and then attempt to monitor, regulate and control their cognition, motivation and behaviour, guided by their goals and the contextual features of their immediate environment (Pintrich 2000: 453). SRL and SDL both involve external management practices and internal monitoring processes (Pilling-Cormick 2011: 398). Although most commonly applied to adult-learning environments, SDL and SRL are also applicable to an online/m-learning system for high-school learners. The mobile learning application and software which students use should have a built-in calendar, reminder and alert features to enable learners to organise their learning and keep-up to date.

As human society progresses from the Information Age to the Interaction Age (Milne 2007), digital networks no longer only carry data in a transactional sense, but also facilitate social interaction. According to Milne (2007: 14) the role of digital content in the Interaction Age has expanded to be not only 'accessible' to students but also real–time interactive. Students engage and construct knowledge socially from digital content (Brill & Park 2008: 70, 71).

Prensky (2001: 1) paints a picture of learners today: "Children are being socialized in a way that is vastly different…over 10,000 hours of videogames, over 200,000 emails and instant messages sent and received, over 10,000 hours talking on digital cell phones, over 20,000 hours watching TV, over 500,000 commercials seen – all before the kids leave college. And maybe at the very most, 5,000 hours of book reading." According to Brill and Park (2008: 71), the thinking and behavioural patterns of learners change partly due to their networked native environment with ever present digital technologies, and increased levels of interaction with technology since birth. Digitally native learners think and process information fundamentally different from their predecessors. They think in parallel and linear patterns and read visual images as one might read text (Prensky 2001).

Dialogue, structure and autonomy determine the degree of separation between the learner and the educator in time and space (Saba 2014). There is an inverse relationship between structure and dialogue. As the structure increases, transactional distance increases and as dialogue increases transactional distance decreases.

Mobile Learning Types

Park (2011: 6) identifies four types of mobile learning in her framework. Each type is classified according to their degree of transactional distance and whether the activity is individualized or social. Figure 4 illustrates Park's pedagogical framework.

Figure 4: The four types of mobile learning: A pedagogical framework

Figure 3. Four types of mobile learning: A pedagogical framework.
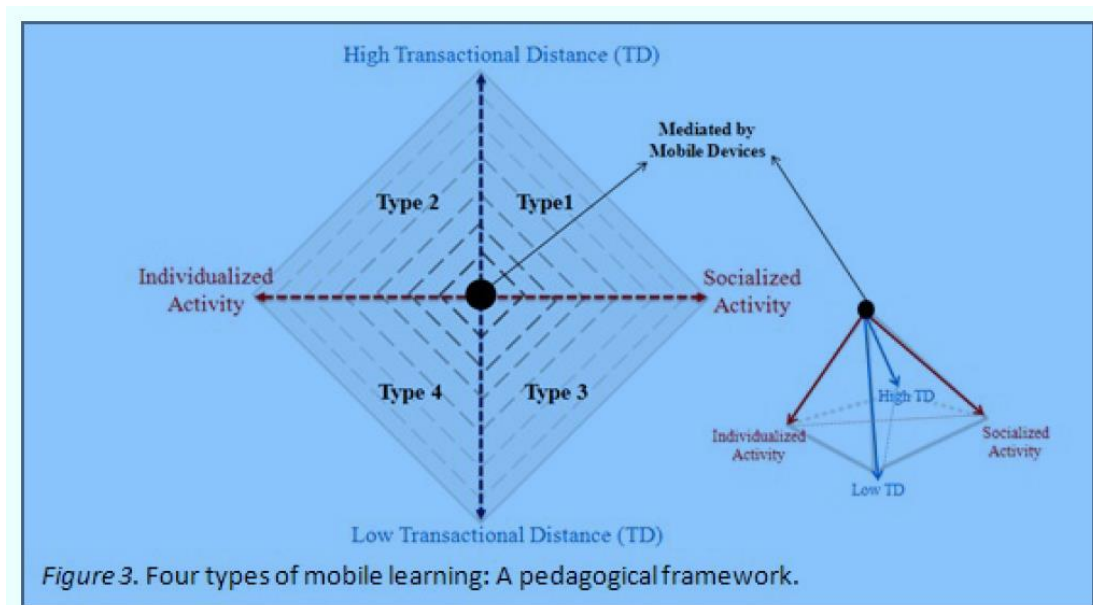
(Source: Park 2011)

My proposed e-learning framework for mobile devices will target Type 2 (High transactional distance, Individualised learning) design and delivery. High transactional distance entails a larger psychological and communication separation between the instructor and the learner. In this scenario the instructor may never meet the learner face-to-face. Learners interact mainly with the educational content and are trained for subject mastery.

Table 6: The 4 M-LEARNING TYPES

M-learning Type	Description	Elements
Type 1 (HS)	**High transactional distance** and **socialised** m-learning Examples:	1. More psychological and communication space between instructor and learners 2. Group learning, collaborative

		projects
	- MCSCL system and activities (Zurita & Nussbaum, 2007) - NetCalc mobile application with educational games (Vahey, Roschelle & Tatar 2004 & 2007)	3. Learning materials and rules are delivered via mobile devices 4. Majority of negotiation and transactions occur among learners 5. Instructors play a minimal facilitating role
Type 2 (HI)	**High transactional distance** and **individualized** m-learning Examples: - Pre-recorded lectures and readings (YouTube videos, online tutorials) - Pre-set practice exercises, tests and memoranda - Mobile Assisted Language Learning (MALL)	1. More psychological and communication space between instructor and learners 2. Learning materials are rigidly structured, very well organised and delivered via mobile devices 3. Learners must master the content 4. Interactions are mainly between the individual learner and the content
Type 3 (LS)	**Low transactional distance** and **socialised** m-learning Examples: - traditional classroom lessons with group activities (like debates) - Audio-based learning forum (Chang 2010a)	1. Learner-to-learner interaction and learner-instructor communication 2. Loosely structured instruction 3. Group work 4. Social interaction and a high level of natural face-to-face communication
Type 4 (LI)	**Low transactional distance** and **individualized** m-learning - Blended learning activities in a traditional classroom setting	1 Individual learners interact with instructor 2 Instructor leads and controls the

	- Mobile outdoor learning activities such as the mobile butterfly and bird watching projects (Chen, Kao, Yu & Sheu 2004; Chen, Kao Sheu 2003)	learning to meet individual's needs 3 Loosely structured, undefined learning content

(Source: Park 2011. The International Review of Research in Open and Distributed Learning 12(2): 7-12)

Khan (2011) mentions how pre-recorded video instruction can eliminate some of the embarrassment for learners who struggle to ask questions in class. Type 2 mobile learning is suitable for recording short video lessons for repeated replay by learners with accompanying assessment and practice tasks. Course materials must be well structured to ensure all subject topics as per the set curriculum are adequately addressed within the stipulated timeframe. Automated memorandum and instant feedback is provided once the learner attempted a question/practice task.

Questions can be structured and formulated to test and build on the first 4 levels of Bloom's taxonomy (remembering, understanding, applying and analysing) for higher order thinking skills development. Eventually, instructional content can include more advanced assessment such as gamified practice or other real-life practical projects to develop learners' evaluation and creation skills. This type of learning can be presented as self-paced units that do not differentiate between the gifted and slow learners. Every learner competes with him/herself. The online system continuously keeps track of learner activity, progress, interaction and scores which is stored and used for further research and analyses. Table 6 provides a summarised explanation of the different m-learning types and their characteristics as per Park's (2011) framework.

Mobile Learning Initiatives among Migrant Groups

The United Kingdom Open University's Journal of Interactive Media in Education published a recent collection of articles about research conducted amongst

migrants in European countries, Australia and Canada. These articles discuss how mobile technology impacts foreign language learning and migrants' integration into society. Jalil, Beer and Crowther (2017: 1) mention that research consistently indicates the difficulty in designing a mobile learning application to support pedagogical purposes. This is mainly due to the different value systems of users from diverse backgrounds and experience (Huang 2009). Mobile learning is still in early developmental stages with technological and pedagogical shortcomings (Liaw, Hatala and Huang 2010) and it lacks standardization with regards to specific educational practice requirements (Nestel et al. 2010; Barbosa 2013). Opportunity exists for the development of mechanisms to address each of these issues mentioned, especially also to cater for similar shortcomings in even more diverse education environments in Africa.

Brooker, Lawrence and Dodds (2017) asked 74 young refugees from three separately recruited samples to construct digital concept maps about the challenges they experienced during resettlement in Australia. A major difficulty for most participants pertained to learning the English language. Their English communication ability in turn impacted on many other aspects of their realities. Brooker et al. (2017: 9) recommend implementing digital media tools to assist refugees in articulating their experiences, so that scholarly understanding can expand to benefit future research. Specific digital programs must be designed and evaluated for supporting refugees to overcome barriers such as: English language, communication and social lives, money, family, health, skills and employment, time management, discrimination, other people's expectations, culture, school tasks, and school rules (Brooker et al 2017: 4, 5).

Gaved and Peasgood (2017) investigated the use of smartphones by migrants for Mobile Assisted Language Learning (MALL). They presented participants with a custom smart-phone application containing location-based hard-ware triggers. The application provided learning activities based on everyday life scenarios that were prompted when the individual approached relevant locations in the UK. Their research findings indicated that social and cultural influences affected the location,

timing and type of learning undertaken. Participants preferred to learn in ways that were unobtrusive and they deferred engagement with the learning content if their immediate social context prohibited the use of the phone (Gaved & Peasgood 2017: 1). The need to 'fit in' and belong socially strongly impacted migrant learners' use of the application.

Denmans Epp (2017) considered the gaps in the support provided by current mobile technology tools to migrants in Canada. Approximately 62 % of migrants in Canada are from non-English speaking countries. The study (Denmans Epp 2017: 1, 11) indicated that migrants could use existing tools to access information, but they required additional support to take full advantage of existing mobile tools. Certain English Language Learners' (ELLs) everyday needs were not met. They required more social, meta-cognitive and emotional support. Too few tools scaffold the larger learning challenges faced by ELLs such as: communication ability, understanding multiple registers, accents, monitoring their own learning and obtaining socio-emotional support. There is thus a need for creating such types of mobile tools.

Muneja (2015: 23) comments that learners in Tanzania are taught in Kiswahili from pre-primary until they finish primary school. They therefore do not have sufficient command of the English language and struggle to express themselves in later years. He proposes that English must be the language of instruction from pre-primary school to University. Online English tuition via an e-learning system can side-step this issue. Learners will still be able to learn in their native language at school but they will also have access to English language tuition and practice through a connected mobile device. An e-learning system creates opportunity for more native African language courses and content to be developed and delivered via mobile devices as well. Currently this is an open niche available to native speakers for utilization. It has job creation potential for language specialists and learners will have access to a much broader selection of languages to choose from, without facing the current physical difficulties of learning African languages. Another advantage is that face-to-face contact and native accent can be retained.

E-learning, M-learning and U-learning

A major purpose of Park's work is to review and classify a variety of educational applications with mobile technologies. Park (2011) compares m-learning with e-learning and u-learning (ubiquitous learning) by placing them on a continuum as indicated in figure 5.

Figure 5: A comparison between e-learning, m-learning and u-learning

	E-learning	M-learning	U-Learning
Physical devices	Wired ---------➤	Wireless ---------➤	Disappeared
Computation & communication	Distinctive	----------------------➤	Blurry
Learning	Confined to the single desk	---------➤	Dynamic/flexible
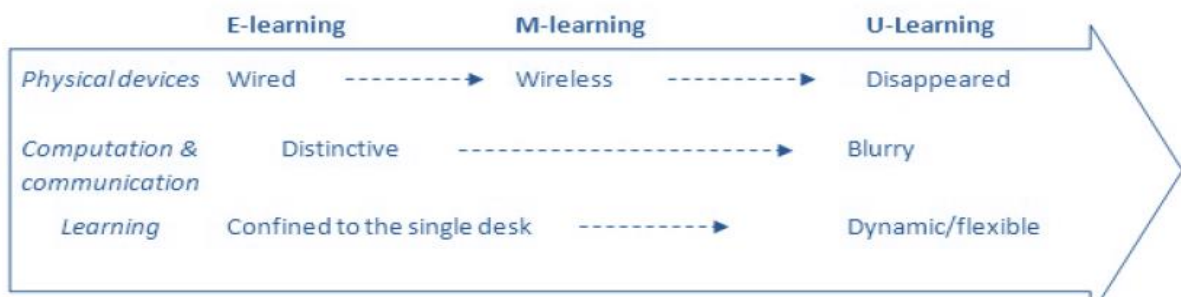
(Source: Park 2011)

Ubiquitous learning is an educational setting where "all students have access to a variety of digital devices and services, including computers connected to the Internet and mobile computing devices, whenever and wherever they need them" (Van't Hooft, Swan, Cook & Lin 2007: 6). It envisions a classroom where the teacher remains focussed on his/her field of expertise while implementing technology to enhance student learning (Crowe 2007: 129).

Although u-learning is a too lofty ideal for a third world country such as South Africa, an e-learning framework for mobile devices could help pave the way for the eventual structuring and creation of such a learning system. This will radically improve the educational setting for many South African and African learners.

Evaluation and Synthesis

Park's (2011) utilization of Moore's transactional distance theory highlights three major variables (autonomy, dialogue and structure) in distance and mobile education. Park identifies 4 types of m-learning in her pedagogical framework, which she illustrates graphically on a two-dimensional plane with 2 axes, between which a specific mobile learning activity can be plotted. I created a summative break-down of the applicable elements for each m-learning type and indicated that my proposed framework will mainly target Type 2 high transactional distance, individualised learning. Dweck's work on fixed and growth mind-sets ties in well with the concepts of self-directed and regulated learning. Prensky's insight on digitally native learners also gives valuable perspective.

Although only in the beginning stages, mobile learning initiatives have been implemented amongst migrant groups abroad and the need for further support tools have been identified. There is opportunity to incorporate mobile /online English tuition in many African like Tanzania were learners do not yet have sufficient command English (Muneja 2015). The ultimate ideal of a ubiquitous educational environment for all learners in Africa and the world is a worthwhile endeavour to aspire to.

The Changing Educational Landscape and Knowledge Economies

Bates (2010: 15) comments on the changing educational landscape and questions the roles universities play therein. This also applies to the schooling system. Bates (2010: 15) asks: "Why is the old culture of teaching and learning failing?", What is the "prevailing culture" of educational institutions and why does this prevent necessary changes?, "How can changes be brought about and what new forms of teaching and learning are needed for the twenty-first century?"

There is a difference between knowledge-based and skills-based economies. The developed Western world consists of knowledge-based economies and sees knowledge as both a product and a process with economic value (Bates 2010: 17-19). Knowledge-based industries as compared to industrial-based businesses are smaller (2 or 3 graduates start their own company) and even if they expand, the majority of knowledge-based companies employ less than 100 people. The work spread is also much 'flatter' (Bates 2010: 19). These companies are often virtual and operate across the internet. Knowledge-based companies depend on innovation and workers need to be creative risk-takers. Knowledge-based workers (Bates 2015: 17) are their own boss or create their own jobs. The nature of their work changes over time in response to market and technological advancements and therefore their knowledge base must evolve often and quickly. They are digitally smart, competent and fulfil many roles in their company (marketing, design, salesperson, accountant/business manager and technical support). They are life-long learners who manage learning for themselves and they depend on informal social networks to bring in business and keep up with current trends in their fields. They must be flexible to adapt to rapidly changing surroundings.

An e-learning framework for instructional design for mobile devices is a step toward renewing an outdated high school educational culture and bringing about educational success for more students in Africa. It has the potential to contribute positively toward the so-called 'decolonisation of education' in South Africa as it aligns with the principle of "all included" and the ideal that education should "speak to" and "generate intellectual capacity for developing the full humanity of all concerned" (Fataar & Kruger 2017). This aligns with the concept and values of Ubuntu. Tutu (2015b) explains that Ubuntu is an ethic of interdependence that recognises that everything an individual does has an effect on others and their well-being and vice versa. Literally translated Ubuntu means a person is only a person through other people (Matshe 2013). Although different, all people are essentially interconnected. Tutu (2015a) shares his dreams of a new world and a new humanity that expresses Ubuntu. Matshe (2013) started her own online business and wrote a movie script to enlighten people in her home country, Zimbabwe. Online video can be an effective medium to reach students throughout

Africa and express the values of Ubuntu. Many students can be uplifted through quality educational content and benefit from skills taught. When making expert teaching available to more students in native languages and by incorporating aspects of learners' cultural foundations, indigenous backgrounds and prior knowledge into the teaching content, learner engagement can be improved because they can relate better to what is being taught and make more real-life associations.

In Teaching in a Digital Age, Bates (2015) discusses the structural social and economic changes affecting education in the digital age. He highlights that teaching methods must be used to develop and transfer specific skills that serve the purposes of knowledge development and dissemination while at the same time preparing graduates for work in a knowledge based society. Educational institutions today are challenged to successfully integrate and accommodate a wide and diverse student body. The vast increase in student numbers has resulted in a regression of teaching, placing more focus on information transmission rather than questioning, idea exploration, communication of alternative viewpoints and the development of critical and original thinking. Bates predicts that as more academic content becomes openly and freely available, students will look increasingly to their local institutions for learning support. This shifts the focus more toward superior teaching skills than subject expertise (Bates 2015: 13). Teaching methods must provide more individualized support and flexible delivery to learners.

Bates (2015: 125) is of the opinion that classroom teaching (especially transmissive lectures) was designed for another age. Greater emphasis should be placed on skills, particularly knowledge management. New teaching models must be designed to develop the skills needed for a digital age. Design models for teaching must be light and nimble so that they can easily be adapted and implemented in an increasingly uncertain, complex and ambiguous world.

Bates (2015: 130-131) equates classroom-type online learning to old wine in new vessels. Lecture capture methods implement a basic classroom design model and nowadays lessons can be automatically recorded and made available online for repeat viewing by students at any time. In a flipped classroom scenario, students access and watch a pre-recorded lecture on their own and then attend class to participate in live discussions. Lecture capture methods have been implemented by 'instructionist' massive open online courses (xMOOCs– eXtended MOOCs) on platforms such as Coursera, Udacity and edX. Educational institutions can also opt to implement learning management systems (LMSs) for distributing and administering courses. LMSs are software that enable instructors and students to log in and work within a protected online learning environment, examples of LMSs include: Sakai, WebCT, Blackboard, Moodle and Desire2Learn. Although video and audio is increasingly being integrated into LMSs, the content is still primarily text based.

Bates (2007: 48) observes the pattern institutions follow when introducing e-learning. He outlines 5 distinct stages:

- **Stage 1 - "Lone Rangers" (Early Adopters)**: E-learning is introduced through the initiative of individual educational staff without the immediate or direct support of the institution.
- **Stage 2 - Encouragement**: Senior management becomes attentive to the activities of early adopters and try to support them with small grants or a reduced teaching load.
- **Stage 3 – Chaos**: After some time a larger number of instructors adopt e-learning but administration becomes concerned about quality, duplication of effort, lack of technical standards and the costs of scaling up to large numbers of classes and instructors
- **Stage 4- Planning**: Senior administration realises the need for setting priorities, establishing common technical standards, developing technical design support and training for instructors and determining cost effective ways of e-learning development to effectively control budget expenditure and instructor workload.

- **Stage5 –Sustainability**: A stable system of e-learning that is cost-effective and scalable is established.

It is critically important to attend to the objectives, core values and principles of the educational institution to successfully transition from face-to-face teaching to e-learning. Bates (2007: 55) is of the opinion that e-learning's chances of success is better if it is perceived as part of a broad strategy of institutional renewal and innovation. E-learning prescribes the adoption of new methods of teaching and learning that is more in line with the needs of a workforce in an information based society. Thus it necessitates a reassessment and amendment of the curriculum. Important aspects highlighted for the planning stage according to Bates (2007) entail:

a) **Student computing policies** (Bates 2007: 57-58) – every e-learning program must have a clear policy statement specifying the need for a device, the benefits it would provide, how the device should be supplied, the minimum technical specifications and the level of skill needed for the student to be allowed entrance into the program.

b) **Support bodies** (Bates 2007: 58-59) **–** A team of select subject experts, instructional designers, Web programmers and media producers must provide ongoing essential e-program design and development support. The Library, Information Systems and Customer Services division also require specialised assistance in the form of resources, IT infrastructure maintenance and improvements by technicians, and administrative portals with improved functionality and management.

c) **Management of Intellectual Property and Academic Content** (Bates 2007: 60) – Digital content management must align with the strategic objectives of the institution. Important issues include: how to best create content for re-use, storage and accessibility in digital format, the ownership of copyrights, the permitted uses of specific content and who has authority to determine the relevant uses, quality control and assurance. Policies for content management must deal with the re-use and sale of content. A registry of all digital e-learning

materials should also be maintained. An IP (Internet Protocol) policy concerning the creation and use of digital materials has to be authorised.

d) **Financial Issues** (Bates 2007: 61) – The long run aim of the plan was to increase student enrolments at a polytechnic by offering new e-learning courses without increasing instructors' net workload. Initially additional costs had to be incurred to train instructors in technical skills needed for e-learning design. It was forecasted that the growth in enrolments would off-set the training charges and government funding was also available to hire additional instructors.

e) **Implementation and Monitoring** (Bates 2007: 61-62) – Key performance indicators for annual monitoring and evaluation of e-learning strategies and activities included: (1) a target number of courses, (2) target five-year budget projections, (3) cost per student enrolled and cost per graduate student, (4) quality assurance procedure implementation, (5) student satisfaction, (6) employer satisfaction, (7) analysis of student enrolments by type of student, (8) course completions, (9) changes in learning outcomes/student performance (10) more effective use of facilities and (11) increased revenues or savings due to the introduction of e-learning.

Bates (2015: 308) puts forward the SECTIONS framework as a practical, research supported model for selecting and using media in education. Oliver (2015: 34) shows the relevance of using this framework to evaluate different alternative assessment instruments in Open Distance Learning and blended-learning environments.

The SECTIONS framework promotes participation of both educators and learners and it encourages student feedback. Teaching is tailored and assessment adapted to address the needs of students. The goal is to transform past ineffective behaviours so that students can become confident, independent thinkers. Unlearning and re-learning is part of its educational processes as people must adapt quickly to fast technological changes which entails continuous un-learning

of old functionalities and re-learning new device functionalities and adapting to newer (upgraded) software with different user interfaces.

Each letter in the title "SECTIONS" addresses a specific aspect of the framework (Students, Ease of use and reliability, Costs, Teaching and learning, Interactivity, Organisational issues, Novelty, and Speed). Educators are allowed to "expand" the topics under each heading to suit their purpose to achieve curriculum learning outcomes.

2.2.4. THE SECTIONS FRAMEWORK BY BATES AND POOLE (2003)

Introduction

Bates (2015: 309) modified the framework slightly to take account of recent developments in technology, research and theory. I provide a summarised diagram of the adapted SECTIONS framework.

Table 7: The modified SECTIONS Framework (Bates 2015)

Elements	Sub-topics
STUDENTS	Student demographics Access to the internet, educational resources and content Differences in how students learn
EASE of USE	Computer and information literacy levels of students Orientation (learning & teaching to use new technology to novices) Interface Design Reliability

COST	Development costs (production, copyright clearance, instructor's time) Delivery costs Maintenance costs Overheads (e.g. licencing costs for LMSs)	
TEACHING FUNCTIONS (Pedagogical Affordances of Media)	Coherence Signalling (Avoid) Redundancy Spatial Contiguity Temporal Contiguity Segmenting	Pre-training Modality Multimedia Personalisation Voice (No) Image
INTERACTION	Interaction with learning materials Students – teacher Student-student	Inherent interactivity Designed interactivity User-generated interaction Control (technology, instructors, users)
ORGANISATIONAL ISSUES	Institutions readiness for teaching with technology: - How the teaching activities are structured - Instructional and technology services already in place - Support provided for media and technology use - Working with professionals and technology experts	

NETWORKING	Supplementing 'standard' learning technologies with social media

Exclusive use of social media for credit courses

Student generated learning resources

Self-managed learning groups

Instructor-led open education resources (e.g. Khan Academy and xMOOCs) |
| **SECURITY AND PRIVACY** | Cloud based security and privacy |

For purposes of comprehensiveness, I explain specific sub-topics of the SECTIONS framework, namely: Ease of use, Teaching functions and Interaction below:

I.   Ease of use - Interface design:

Any educational program/website must be well structured, easy to navigate and intuitive to use both by the teacher and the student. Screen lay-out and graphics must align with users' preferences for processing information and ways of learning of students [visual (spatial), aural (auditory-musical), verbal (linguistic), physical (kinaesthetic), logical (mathematical), social (interpersonal) and solitary (intrapersonal)]. New developments in learning interfaces have improved user friendliness with touch screens and activated voice interfaces.

II. Teaching functions (Pedagogical affordances of media)

Bates (2015) refers to the work of Mayer (2009) to illustrate 12 principles of multimedia design (based on learners' cognitive processing abilities) to ensure that effective teaching takes place. Mayer's research centred on cognitive overload in multimedia teaching. The 12 principles of effective multimedia design according to Mayer (2009) are:

i. Coherence - *Learning is enhanced when irrelevant (extraneous) words, pictures or sounds are excluded. Keep it simple.*

ii. Signalling -*Cues (prompts) must be added to point out the essential material so that learners know what to look for in the multimedia materials.*

iii. (Avoid) Redundancy- *People learn better from graphics and narration than from graphics, narration and on-screen text.*

iv. Spatial contiguity- *Corresponding words and pictures should be placed near each other on the page/screen and not far apart.*

v. Temporal contiguity- *Corresponding words or pictures presented simultaneously are more effective for learning purposes than if they occur successively.*

vi. Segmenting- *A multimedia lesson presented in user-paced segments (micro-chunks) is more effective than a continuous, long recorded lesson.*

vii. Pre-training- *Learning is enhanced when learners are familiar with and taught the names (key terms) and characteristics (definitions) of the main concepts, before detailed examples or applications are tackled.*

viii. Modality- *Learning is more enhanced through graphics and narration than from animation and on-screen text.*

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ix.   Multimedia- *People learn better from words and illustrations (pictures) than only words.*

x.   Personalisation- *Lessons presented in a conversational rather than a formal style is more effective.*

xi.   Voice- *A friendly human voice is preferred to a machine-like voice.*

xii.   (No) Image- *Learning is not necessarily enhanced by a multimedia lesson when the speaker's image is added to the screen.*

Talbert (2018), currently an associate professor in Mathematics at Grand Valley State University, Allendale, Michigan shared his experience when developing a series of successful screencasts on mathematics. Talbert's design guidelines according to Bates (2015: 334-335) are to: 1) Deal with one idea at a time and keep it simple. 2) Keep it short by recording videos of between 5 and 6 minutes to optimise attention. 3) Keep it real by modelling expert learners' decision making and problem solving processes and 4) Keep it good by being intentional about planning the video to produce the best video and audio quality.

III.   Interaction

There are 7 sub-categories that fall under the topic of Interaction in the SECTIONS framework. I only address the four less obvious ones, namely: inherent interactivity, designed interactivity, user-generated interactivity and control.

i.   **Inherent interactivity** – certain media 'push' learners to respond. For example in adaptive and behaviourist computer-based learning a learner cannot progress to the next level without interacting through a test that determines whether they have mastered content well enough to advance or whether 'corrective' learning must first take place. This type of media is

very suitable for Type 2 mobile learning (high transactional distance, individualised learning) as per Park's (2011) pedagogical framework.

ii. **Designed interactivity –** a web page is not inherently interactive, but it can be designed to promote interaction by adding a comment box, prompting users to make selective choices or input information. A podcast can also be developed where learners stop the podcast after every few minutes and complete an activity relating to the content.

Where instructors have to intervene either to design activities or to provide feedback, the cost or time demands on the instructor are likely to be greater than if the media is inherently interactive or end user interactivity is generated voluntarily.

iii. **User generated interactivity**- Some media follows a constructivist learning approach, encouraging learners to be independently active without the intervention of a teacher/instructor. The creators of a work of art/poem/novel may deliberately design the work to elicit reflection or analysis, but not explicitly, leaving the interpretation open to the viewer/reader. This type of interactivity is more difficult to monitor or assess, but it does have cost advantages.

iv. **Control -** The dimension of control is a complex one that is influenced by epistemological positions and by the instructor's design decisions. Bates (2015: 241) asks: To what degree does the technology, creators (instructors) and users (learners) control and enable interaction? What type of interaction would result in the desired learning outcome? And which medium/technology would facilitate such an interaction?

Bates (2015: 561-569) provides helpful guiding questions for each element in the SECTIONS framework to assist the educator/instructional designer in obtaining critical information so that optimal decision making regarding selection and use of media and technology can occur.

Application of SECTIONS Framework by Other Researchers

Worthington (2017: 199-205, 217-219) applied the SECTIONS framework to assist decision making concerning technology and media implemented in a new 'Innovation, Commercialization and Entrepreneurship in Technology' course for students enrolled in STEM (Science, Technology, Engineering and Mathematics) degree programs at universities in Canberra, Australia. Worthington (2017) analysed technologies such as: e-mails, list servers, electronic portfolios, Learning Management Systems, video conferencing, social software, podcasts, cloud computing and web 2 technologies (RSS -Really Simple Syndication, Blogs and Wikis). He experienced that the SECTIONS framework does not assist with optimal implementation of combinations of technologies.

Palalas (2011: 108-131) successfully evaluated the effectiveness of iPod Touch technology in a hybrid ESP (English for Special Purposes) adult course at George Brown College in Toronto, using Bates and Poole's SECTIONS framework. Participants in the study stated that the design and presentation of the learning materials had a greater impact on the effectiveness of the course than the technology used.

Gosper, Woo, Muir, Dudley and Nakazawa (2007: 227-239) incorporated Bates and Poole's framework to select and assess software suitability for curriculum redesign of a university level Japanese language program. They developed three analysis instruments which incorporated elements of the framework to assist with selecting applicable software for ICT integration and curriculum reform. The analysis instruments included a curriculum needs analysis, ICT requirements and capability analysis and organisational support and interoperability analysis (Gosper et al. 2007: 229).

Evaluation and Synthesis

When comparing the SECTIONS framework to other frameworks in the literature review, I found it to be easily understandable and at the same time very comprehensive. No other framework went into detail regarding the pedagogical affordances of the teaching media, which is a crucial aspect for optimal e-learning and m-learning instructional design. As was evident from Palalas' (2011) study, the design and presentation of the learning materials influenced the effectiveness of the e-course much more than the technology used. For a South African e-learning/m-learning system to be most effective, the learning materials (content) will have to be high quality and designed taking Mayer's (2009) multimedia principles into consideration to ensure successful delivery.

2.2.5. THE MOBILE CSCL FRAMEWORK BY ZURITA AND NUSSBAUM (2007)

Introduction

The Mobile Computer Supported Collaborative Learning (MCSCL) framework was specifically designed with "face-to-face", "collaborative" activities and group "social interaction" in mind (Zurita & Nussbaum 2007: 212). It is based on Activity Theory, a descriptive meta-theory that takes into account entire work/activity systems (teams, organisation etc.) and not only individual actors or users (Activity Theory 2018). People are seen as socio-culturally embedded actors (not processors or system components) and human practices and developmental processes are analysed within simultaneously linked individual and social levels (Kuuti 1995).

Activity Theory and the Activity Theory Model

The main principles of the Activity Theory (Kuuti 1995: 23) state that motivated activities directed at an object or goal (such as an experience, knowledge or physical product) serve as the basic units for measuring human practices and are

always considered within context, never in isolation. According to Kuuti (1995) a historical analysis of the progression/change of an activity is performed to get a whole picture of the situation. Every activity involves different tools, instruments, methods, rules and forms of work (these are referred to as artefacts). Artefacts serve a mediating function to achieve a desired outcome (Kuuti 1995).

Figure 6 demonstrates that in addition to an activity's subject, object, tools and outcomes, one should also take into consideration the rules governing the activity, the community within which the activity takes place and the division of labour between participants. All these elements are interrelated, interact and affect one another (Kuuti 1995).

Figure 6: The expanded Activity Theory model
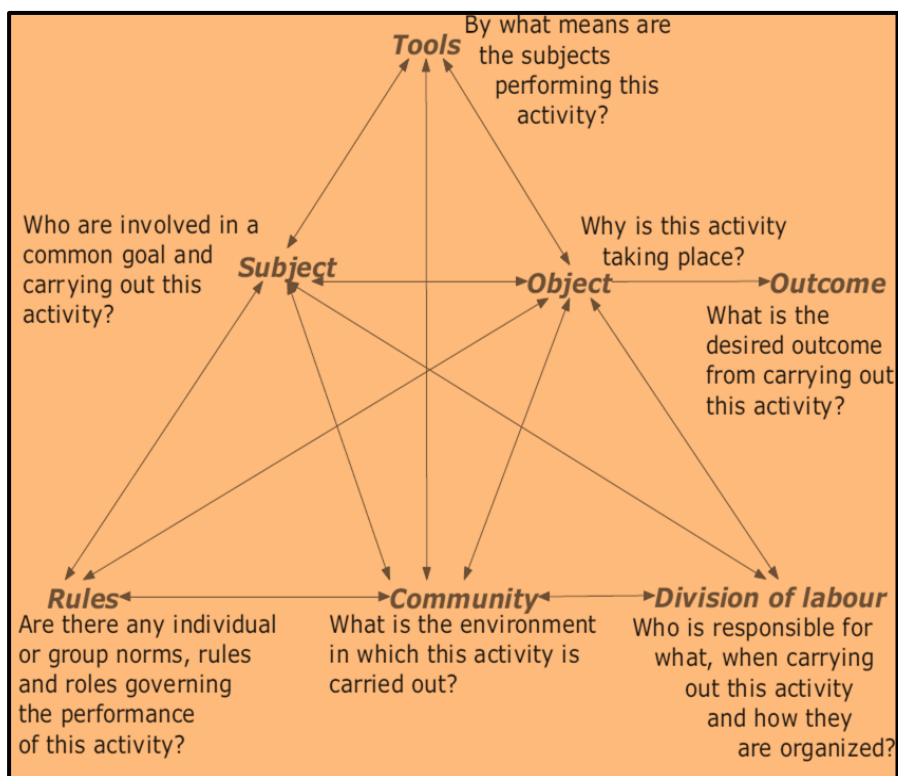
(Source: Zurita & Nussbaum 2007: 215)

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Applying Activity Theory in a CSCL Environment

Jonassen and Rohrer-Murphy (1999: 70-77) present a six-step process for applying Activity Theory in a Computer Supported Collaborative Learning (CSCL) environment. They detail sub-steps for each major design step and provide corresponding questions and actions to analyse an activity system. I summarise below.

Table 8: The 6-steps for applying Activity Theory in a CSCL environment

1. Clarify the purpose of the Activity System
Understand the **context** within which activities occur (where and when the activity takes place, the purpose of the activity and the communication surrounding the situation).
Understand the **subjects** (participants), their **motivations** and **what is expected** of them.
2. Analyse the Activity System
Define the **subject (participants)** and their **expected outcomes**. Determine the implied **roles and rules** for each participant.
Define the relevant **community** (e.g. structure of **social organisation**, group **maturity**, how **conflicts** might occur).
Define the **object (desired outcome)** of the activity and determine what **criteria** will be used to **evaluate the quality** of the outcome and **who will apply the criteria**.
3. Analyse the Activity Structure
Define the **activity** itself. Establish **how work is being done** in practice and **how it has transformed** over time. Evaluate if any **theoretical foundations** have changed as a result. Find out **participant opinions/views** about the activity.
Decompose the activity into its **components and operations** (observe the actions being performed and by whom) and record it.

4. Analyse Mediators
Tool mediators and mediation – **what tools** are used, how have they **evolved** and how **available** are they to participants? Distinguish between **physical tools** (machines/instruments) and **cognitive tools** (methods, languages, signs, procedures etc).
Rule mediators and mediation – what **formal/informal rules** guide the activities and **how have they changed** over time. Are the rules **widely understood**?
Role mediators and mediation – who **customarily fulfils** specific roles and how are **group dynamics affected**? How do the roles correspond to the **non-academic experiences** of participants and how much **freedom** do they have **to change roles**. What **forces** drive role changes?

5. Analyse the Context
Internal (subject-driven) contextual bounds. What **beliefs, assumptions and methods** are held by participants? What **language** do participants use to describe their experiences? Which **tools** did they find **(un)helpful** and how **willing** are they **to use** them **again**?
External (community-driven) contextual bounds. The **degree of freedom** for participants to **enter/exit** a work group. Which **activities** are **crucial** for participation and which will be graded? How are tasks **divided, shared and organised** amongst participants? What **limitations** will be placed on the activity?

6. Analyse Activity System Dynamics
Interrelationships existing within system components and how **formally/informally established** they are and **how they have changed** over time and if these changes are of a **permanent** nature.

Evaluation and Synthesis

According to Hsu and Ching (2015: 11) the MCSCL framework connects and builds on the different nodes in the extended activity theory model. The social and technological components assist mobile collaborative learning (MCL) designers to identify the interactions of various aspects within the context of collaborative learning.

According to Bulger, Mayer and Almeroth (2006) an intentionally engaged learning design achieves higher levels of learner attention and on-task behaviour. An engaged learning design incorporates a real-world task and environment presented via simulation. It consists of directed interactive activities, a facilitative teacher, a deliverable learning product, and role-modelling.

When compared to other frameworks, I found the MCSCL framework and supporting diagrammatical illustrations (Zurita & Nussbaum 2007: 216, 217) to be very complicated upon first exposure. It was piloted on primary school learners and not high school learners. The e-learning/m-learning system I envisage for the FET phase does not put forward "face-to-face, collaborative activities and social interaction" (Zurita & Nussbaum 2007: 212) as main priorities, but the following concepts do apply:

1. **Context and Participants** – Grade 10-12 learners should be able to access standardized content in any place and at any time, given that they have a mobile device and working internet connection.

2. **Expectations and Outcomes** – By accessing the materials and systematically working through the m-learning materials learners should be able to progress to advanced levels of difficulty and attain higher results. Enrolment rates, pass rates and overall education standards across the FET phase can be improved.

3. **Mediators (Artefacts) / Tools (Physical and Cognitive)** – Mobile devices act as the physical tools and the mobile application and learning content serve as cognitive tools that should be updated continually.

4. **Rules** – Basic rules of conduct, confidentiality / data privacy regulations and intellectual property rights will have to be drawn up. The mobile application should have built in features that prevent a learner from progressing to a more difficult topic before achieving a satisfactory level of proficiency on an easier level. Learners should also not be able to create multiple accounts/registrations or 'fake' accounts.

5. **Activities** – The mobile learning materials and 'gamified' assessment practice classify as the 'activities' which learners participate in. These will be graded so that learner progress can be tracked and monitored.

Motiwalla's (2007) M-learning Framework highlights important aspects of learning instruction using mobile devices. It paved the way for the development of Bruck, Motiwalla and Foerster's (2012) Micro-mobile learning framework. Both frameworks have unique, important attributes applicable to this study, therefore I discuss each below.

2.2.6. THE M-LEARNING FRAMEWORK BY MOTIWALLA (2007) AND THE MICRO-MOBILE LEARNING FRAMEWORK BY BRUCK, MOTIWALLA AND FOERSTER (2012)

Introduction

Motiwalla (2007: 582, 583) motivates that mobile learning can support both the social constructivist theory and the conversation theory. Constructivist theory implies that learning takes place when a learner acts (e.g. solving a problem) and reflects (e.g. retrieves and thinks on his experiential knowledge) in an

environment. Conversation theory states that continuous two-way conversations and interactions between teachers and learners must occur for learning to be successful.

The M-Learning Framework

Results from Motiwalla's research indicated that students preferred a combination of 'push' and 'pull' mechanisms for communication and content delivery (Motiwalla 2007: 591-592). Pedagogical agents and mentors (teachers and instructors) must be able to 'push' the learning content to the learners via their device. And learners should also be able to 'pull' the information they need (e.g. scheduling, grades and learning content) to their devices (Hsu & Ching 2015: 10). The m-learning system must support both personalized learning (e.g. assignment due alerts) and collaborative learning (e.g. chat room, discussion board, instant messaging).

Table 9: The M-learning Framework (Motiwalla 2007)

	Personalized Content	Collaborative Content	
PUSH Mechanism	*Pedagogical Agents & Mentors*	*Communication Aids*	*SMS, IM, Alerts, Scheduling Calendars*
PULL Mechanism	*System Tools & Resources*	*Simulated Classrooms*	*WML websites, Discussion Boards & Chat Forums*
	Alerts, Scheduling Calendars, WML websites	*SMS, IM, Discussion Boards & Chat Forums*	**M-learning Applications**

(Source: Motiwalla 2007: 586)

I agree with Motiwalla's (2007: 586) claim that content delivered to students is more useful when it is personalized and collaborative. The proposed framework will allow for a standardized curriculum and set of content to be made available for students. According to Liaw, Hatala and Huang (2010: 446) adult learners can also be attracted by the one-to-one interaction, extended research capabilities,

personalised learning and place and time independence offered by m-learning. Access to wireless high-speed internet and a mobile device enables hands-on, inquiry-based learning to take place (Brand, et al. 2011: 169) and it keeps student materials light-weight and portable for remote access.

Evaluation and Synthesis

Hsu and Ching (2015:10) view Motiwalla's (2007) framework as relatively simple and less comprehensive compared to other frameworks. The technological architecture (hardware) illustrated by Motiwalla (2007: 587, 588 & 590) is outdated. Today's devices like smart phones allow easy access for much more. Kayode, Alabi, Sofoluwe and Oduwaiye (2015) write about the technical challenges experienced when using input and output functions on mobile devices. A small screen size can be a limiting factor that makes entering text on a mobile device difficult. This can dissuade a learner/educator from using the device in a learning activity. Attewell and Savill-Smith (2004) observed that using mobile devices could foster indifference and laziness amongst learners regarding correct spelling and grammar which impacts negatively on writing quality. Motiwalla's (2007: 594) comparison between e-learning and m-learning is insightful and the platforms and applications he has investigated, worthwhile to note, however not addressed in this discourse.

The Micro-Mobile Learning Framework

Bruck, Motiwalla and Foerster (2012) adapted the original M-learning framework to incorporate micro-learning. Micro-learning combines micro-content delivery with a series of micro-interactions to prevent information overload (Bruck et al. 2012: 527). The pedagogy entails short-term, informal learning activities or on-the-job learning when a learner problem-solves (Kovachev et al. 2011). Benefits of this type of mobile learning environment are that learners and instructors can use their spare time while travelling to finish homework or do lesson preparation (Virvou & Alepis 2005) just-in–time (Cornell 2002). It leverages the ubiquity, intimacy and usability of mobile devices with smaller screens and keyboards for a new form of

learning (Bruck et al. 2012: 539). Table 10 illustrates the M-Mobile learning framework as developed from the original M-learning framework.

Table 10: The Micro-Mobile Learning Framework (Bruck et al. 2012)

Mobile-Micro Learning	Conversational Pedagogy	Collaborative Pedagogy	Examples
PUSH Technology	Learning Aids & Mentoring Agents	Communication Aids	Digital Flash Cards, Push Buttons, Alerts, (ex: KnowledgePulse⟶)
PULL Technology	System Tools & Resources	Simulated Classrooms	e-learning Apps, Social Networks & IMs (ex: MicroStep™)
	Alerts, Flash Cards, micro-Blogs, micro-Wikis, micro-assessments	Social Nets, Tweets, SMS, MMS	⬆ ⬅ M-M Learning

(Source: Bruck et al. 2012: 540)

Micro-content and Micro Learning

Micro-learning is driven by 3 factors: technological innovation, economic imperatives and cultural practices (Robes 2009). In micro-learning, learning content is broken into smaller (micro) chunks with high levels of interaction and instant feedback after each user action (Bruck et al. 2012: 530). Simon (1974) indicated that learning is improved when content is broken into digestible parts with steps that follow each other. Cowan (2001) wrote about people's limitations when processing information in short term memory and that "chunking" information assists with activating and retrieving information from short term memory.

Evaluation and Synthesis

The standardized m-learning content, I envisage for the FET-phase should be micro-chunked (individual video lessons and animations should not exceed 10 minutes and an assessment practice task should take between 5 to 15 minutes to complete). Micro-learning is not appropriate in every educational setting and should be viewed as a complement to other forms of learning (Bruck et al. 2012: 530). Micro-content has great potential for mobile learning because many Web 2.0 applications already offer content in small chunks (short messages, micro-websites, blogs, wikis, podcasts, news apps and Twitter) (Bruck et al. 2012: 530).

Web 2.0 refers to the second stage development (also the current state) of the internet as compared to the traditional Web 1.0 (World Wide Web) online technology. Originally, web pages were static and users could only view or download content that was posted on web sites. Nowadays, there is more user interactivity and collaboration through enhanced communication channels making the web much more social and allowing users to generate and contribute their own content (Rouse 2015). A wiki is such a type of website where users collaboratively modify and structure content directly from a web browser (Wikipedia 2018e)

2.2.7. THE PEDAGOGICAL FRAMEWORK FOR AN E-LEARNING SYSTEM BY RAMANAND (2013)

Introduction

Ramanand observed the need for a pedagogical framework that guides the design and development of e-learning systems. She proposed a framework with three main dimensions. The foundation dimension entails planning, analysis, design, testing, evaluation and implementation. The support dimension involves management, maintenance, assessment and implementation. The cyclic

dimension includes the review and improvement stages of the e-learning system (Ramanand 2013: 4-3).

Framework Stages

The planning stage of Ramanand's framework identifies all stakeholders (learners, instructors and others) involved in the process. It specifies learning styles and principles and establishes the level of teaching and the instructional goals to be achieved. It also outlines learning conditions and maps a plan to overcome barriers to learning. It determines how to best pitch and present learning materials so that it is in line with curriculum and policy requirements. The e-learning system I envision will present a CAPS (South African Curriculum and Assessment Policy Statements) aligned curriculum pitched to the developmental level of learners and presented in a user-friendly manner.

The design and analysis stage entails a needs assessment to specify learning levels, content and resources to determine the suitability of different technology options, educational media and learning activities. Risks and constraints concerning the e-learning system are outlined and a user requirements specification document is produced to give guidelines regarding learner and stakeholder requirements (Ramanand 2013: 4-8). When developing an e-learning system, I think such a document could prove very helpful. Existing technology and new technology must be analysed according to cost-effectiveness, reliability, security, robustness and it's applicability to address learner needs and achieve learning. An important aspect is that the technology should not cause disruptions to learning and teaching. My proposed framework aims to promote learning, not to disrupt it.

Evaluation, Synthesis and Concluding Remarks

I support Ramanand's (2013: 4-9, 4-10) idea of using storyboards to generate instructional objectives and strategies surrounding lesson design and delivery, assessment and feedback. Story boards can become the visual 'content-delivery' tool for instructional content presentation, but quality assurance prescriptions must be adhered to. Online training manuals and video tutorials can help guide learners and educators through the e-learning process.

2.3. SUMMARY OF E-LEARNING FRAMEWORKS

All e-learning frameworks discussed show similarity in concept and viewpoint. They do not build directly on one another, but complement unique aspects of each other. Different technologies are employed to attain a corresponding end result. Similar systems, input, output, user problems and needs are addressed. Each framework plays a role in moving forward. The intentions are clear and the efforts to establish worthwhile thinking methods and practical constructs are positive. A tabular summary of all 7 frameworks is constructed below, highlighting the main features of each with links to relevant information sources. This may present an opportunity for empirical study when implemented in a school system. I have no knowledge of any particular school in South Africa where these frameworks have been implemented or used with students yet.

Framework	Author and Year	Features	Links to online sources
The Global E-learning Framework	Badrul Khan 2001	8 Dimensional MOOC's can be employed Raises the bar of educational delivery and accessibility Applicable to African educational environment Evaluative of mobile learning Applicable model : P3 Model	Global E-learning Framework
The M-COPE Framework	Dennen and Hao 2014	Mobile oriented alternative Directed towards affordability Encourages pedagogy and ethics Establishes suitability of learning through flowchart Applicable model : ADDIE Model	M-COPE Framework ADDIE Model

The Pedagogical Framework for Mobile Learning	Park 2011	Identifies relevant variables of dialogue, structure and autonomy Based on research done in emerging technologies Addresses the current 'Interactive Age' as opposed to 'Information Age' Presents 4 types of mobile learning (4 M-learning types) within pedagogical framework Reviews and classifies educational applications with mobile technologies	Pedagogical Framework M.G Moore (Transactional Distance theory)
The SECTIONS Framework	Bates and Poole 2003	Based on Academagogy Theoretically and Pedagogically sound User friendly, easily implementable User generated interactivity	SECTIONS Framework
	Bates 2012 (modified)	High educational impact through design & presentation Aids assessment and evaluation of software and media suitability Applicable model : The SECTIONS model	

The Mobile CSCL Framework	Zurita and Nussbaum 2007	Based on Activity Theory Designed for collaborative, face-to-face learning Aids analysis of any activity system via action-questions Facilitates planning & execution of mobile educative activity The design provides higher levels of on-task behaviour	MCSCL Framework
The M-Learning Framework	Motiwalla 2007	Based on Conversation and Constructivist theory Supports personalized and collaborative learning Known for push-pull mechanisms Includes a simplistic app analysis indicating framework intersect at 6 cells of technological sophistication	M-Learning Framework MM -Learning Framework
Micro & Mobile Learning Framework	Bruck, Motiwalla, Foerster 2012	Incorporates micro-learning with its 3 driving factors Beneficial to on-the-job problem solving Illustrates how push-pull technology manifests through conversational and collaborative pedagogy	

| The Pedagogical Framework for an E-learning system | Ramanand 2013 | Consists of foundation, support and cyclic dimensions

Allows for continuous adaptations and developments

Explains pitching of content in line with policy & curriculum requirements

Entails a needs assessment

Utilizes storyboards | Dissertation & Framework |

2.4. CONCLUSION

The literature review distinguished between an educational framework and a model. I investigated 7 existing e-learning frameworks, their relevant underlying learning theories, unique individual characteristics and how other scholars have implemented them. A summary with key features of each framework is also provided. It has been insightful and inspirational studying these frameworks towards further adaptation and development to elevate education n Africa.

Chapter 3 examines different learning theories with corresponding pedagogical considerations that are fundamental to an e-learning environment.

CHAPTER 3: TEACHING AND LEARNING THEORIES

3.1. INTRODUCTION

In Chapter 2 the unique elements pertaining to 7 existent e-learning frameworks were discussed and key features of each summarised.

Chapter 3 looks at the difference between a theoretical and conceptual framework, the components of scholarly theories and the criteria for choosing a theory. Three learning theories applicable to an e-learning environment are selected for detailed discussion. Specific benefits pertaining to mobile education as identified by UNESCO (Kraut 2013) are also highlighted.

3.2. THEORETICAL AND CONCEPTUAL FRAMEWORK

3.2.1. Introduction

In addition to performing a literature review a researcher must select a suitable theoretical framework as foundation for knowledge construction (Grant & Osanloo 2014: 12). The researcher's choice of theoretical framework reflects important personal beliefs and understanding about the nature of knowledge, how it exists in relation to the observer, the roles to be adopted by the researcher and the tools to be employed (Lysaght 2011: 572).

Bezuidenhout, Davis and Du Plooy-Cilliers (2014: 37) describe a theory as a systematic (step by step) description of concepts, constructs and relationships of processes and phenomena in a specific discipline. It shows how and why particular concepts are related and forms the grounding in which a study is rooted. Theories

constitute the academic foundation of every discipline and they allow for information to be transformed into knowledge (Littlejohn & Foss 2008). Grant and Osanloo (2014: 13, 14) equate a theoretical framework to a blueprint for a house. It acts as a guide for building and supporting the entire dissertation inquiry.

A distinction must be made between a theoretical and conceptual framework. Where a theoretical framework is derived from existing theory in the literature that has already been tested and validated (Grant & Osanloo 2014: 16), a conceptual framework is the researcher's understanding of how the research problem will be best investigated, the direction of the research and the relationships between the variables in the study (Grant & Osanloo 2014: 17). Addressing the research problem and the direction of this research was dealt with in Sections 1.5 to 1.8 of Chapter 1. Section 3.3 of this chapter considers existing education theories informing the theoretical framework of this study (more detail regarding the study's rationale is given in Chapter 4, Section 4.2.). And Sections 4.3 and 4.4 elaborate on the applicable research paradigms. Sections 4.5 to 4.7 include detailed discussions regarding the research design and methodology constituting the conceptual framework for this study. The components of scholarly theories and the principles for selecting applicable theories to form a theoretical framework are elaborated upon below.

3.2.2. Components of Scholarly Theories

Basic, fundamental components shared by scholarly theories are: **assumptions, concepts, relationships, and prediction and explanation** (Bezuidenhout et al 2014: 41). A short explanation of each component follows.

Assumptions are unconfirmed initial statements about the nature of human existence, phenomena and a theory or a belief in a theory. Assumptions act as points of departure to explain and test theories. An assumption relating to this study

is that all African learners in the FET phase can benefit from an e-learning system with standardised content.

Concepts are key elements of a theory. They consist of a label (symbol) and a definition. When we name a concept we give it a label (verbal symbol) and the definition of the concept serves to explain it. Concepts comprise varying levels of abstraction. These can be direct, concrete, observable or abstract mental constructs (which are difficult to express) applicable to a theory. A list of key concepts was provided in Section 1.11. of Chapter 1 with applicable definitions.

Relationships between concepts are made clear in theories by describing the fundamental associations between them. Theories also assist with organising research phenomena and in making sense of experiences. They point toward appropriate areas of a phenomenon to study. Critical theories enable researchers to contest social and cultural practices so that new ways of thinking and acting can be implemented. This study investigates the relationship between technological advancements, educational delivery and education standards. The effectiveness of current South African educational policy for driving and supporting e-learning initiatives are analysed and compare these with international educational strategies.

Prediction and Explanation: A prediction (hypothesis) is an assertion that an event or outcome of a research study will occur given specific circumstances. This study does not entail any quantitative processes therefore no hypothesised predictions are made. Explanations are incorporated and provided throughout this study (Bezuidenhout et al. 2014: 43).

Littlejohn and Foss (2008) propose criteria for selecting the most applicable learning theories. They give specific standards such as theoretical scope, appropriateness, heuristic value, validity, parsimony and openness to determine the usefulness of a theory (Littlejohn & Foss 2008: 29-31). These criteria will not be discussed in detail,

but I keep them in mind when evaluating existing learning theories for applicability in e-learning and m-learning environments.

Numerous teaching and learning theories exist. Muneja (2015: 6) explores perennialism, essentialism, progressivism and re-constructionism as learning theories applicable to the secondary curriculum in Tanzania. Oliver (2015: 28) identifies pedagogy, andragogy, heutagogy and academagogy as applicable for alternative assessment in open distance education. Mukhari (2016: 29) investigates the theories of behaviourism, constructivism and connectivism in the context of ICT implementation in the 21st century. Transactional distance theory, activity theory and conversation theory were dealt with briefly in the e-learning framework analysis (literature review) done in Section 2.2. I will only select three applicable learning theories for the purposes of this research, to support a proposed e-learning framework for Africa.

3.3. TEACHING AND LEARNING THEORIES

Introduction

Mobile devices have smaller screens and input keys, therefore they are excellent to use for drill and practical exercises which is characteristic of behaviourist education (Chen 2011) practice and thus an appropriate theory for a mobile e-learning environment with standardised content and instantaneous feedback. Constructivist theory also applies to e-education because students are actively involved in knowledge and meaning creation (Jenkins 2006) while using their mobile devices. Connectivism (Siemens 2005) relates to the networked digital, fast-paced, communication age and is thus also relevant for e- and m-education design and provision. These learning theories are discussed below.

3.3.1. Behaviourism

Introduction

Behaviourists agree that learning results from a response to an external stimulus. The repetition of the stimulus-response (S-R) cycle, conditions the learner to exhibit the same response whenever the stimulus is present (Chen 2011: 1259).

Ivan Pavlov and Classical Conditioning in Dogs

Ivan Pavlov (1849-1936) paved the way for the development of behaviourist theory. He investigated classical conditioning (or stimulus substitution) among dogs and found that dogs can be trained to salivate (exhibit a conditioned response) when they hear the sound of a bell (conditioned stimulus) because they associate the sound with food (unconditioned stimulus). When the unconditioned stimulus (food) was no longer paired with the conditioned stimulus (the bell), the salivation response stopped (extinction), but it could be spontaneously recovered after lapsed time if food was presented again. The dogs also exhibited higher order conditioning when an additional unconditioned stimulus (a flashing light) was introduced at the same time the bell was rung with food. Eventually the dogs salivated at the flash of the light without the sound of the bell (Mergel 1998). Classical conditioning per Pavlov's experiment, forms part of respondent type learning which involves emotional, psychological and involuntary reactions such as instincts or reflexes. Although effective, this type of learning is incidental (Tanes 2016: 176).

Edward Thorndike and the Respondent Learning Approach

Edward Thorndike (1874-1949) was another important contributor to behaviourist theory and also an implementer of the respondent learning approach. He introduced three laws of learning based on the *connectionist* school of thought that learning

results from the formation of connections between stimuli and responses. Connectionist behaviourism emphasises the role of habit and the practicality of stimulus response pairings to establish behavioural patterns (Jones 2015: 50). The *law of effects* proposes that the strength of a connection depends on what follows it. The *law of exercise* maintains that practice enhances connection, while disuse weakens it and the *law of readiness* suggests that if the organism is physically ready, the connection will satisfy him/her (Chen 2011: 1261). Thorndike opined that when a response was positive, a neural bond was formed and when these bonds formed into patterns of behaviour, learning took place (Saettler 1990).

John Watson, Human Conditioning and Emotional Responses in Humans

John Watson (1878-1958) is credited with actually originating the term behaviourism. Watson's research advanced from pure animal research to include human subjects as well. He demonstrated how conditioning impacts and determines human emotional responses to certain stimuli and his research emphasised the prediction and control of behaviour (Jones 2015: 50). Watson conducted a study involving a young boy (Albert) and a white rat. Initially the boy was not afraid of the rat, but Watson repeatedly made abrupt, loud noises whenever Albert touched the rat which conditioned the boy to fear and avoid the rat. This fear could be generalised to other small animals as well. Researchers (Good & Brophy 1990; Samelson 1980) suggest that Albert's conditioned fear of the rat was much more intensified and permanent than the noise actually was in reality.

Friederich Skinner and Operant Conditioning

Nowadays, Skinner's name is most often associated with behaviourist theory and technology in education. B. Friederich Skinner's (1904 - 1990) work pivoted around operant conditioning. Operant conditioning involves voluntary (by choice) behaviours performed by organisms when operating in/on their environment whereas respondent (classical) conditioning entails involuntary, reflexive behaviours. Active

(voluntary) behaviour generates consequences and allows for a feedback loop of positive and/or negative reinforcements. These reinforcements in turn influence future behaviour (Jones 2015: 50). Skinner attempted to explain human motivation in terms of such deprivation and reinforcement schedules. The principles and mechanisms of operant conditioning (Chen 2011: 1262) are explained below:

1. Positive reinforcement/reward – any stimulus (or consequence) that strengthens a desired response (behaviour) is a reinforcer. Verbal praise, a good grade or a feeling of satisfaction are all examples of positive reinforcement. Repetitive reinforcement was found to be very effective in establishing and maintaining behaviours.

2. Negative reinforcement – Behaviour that allows for escape from a painful or undesirable situation (consequence) is likely to be repeated. A stimulus that results in more frequent responses when withdrawn is called a negative reinforcer (this is different from punishment or aversive stimuli).

3. Punishment – A response that brings a painful/undesirable consequence will be suppressed, but may reappear if the reinforcement event changes or a different reinforcer is implemented.

4. Extinction/non-reinforcement – Responses that are not reinforced will become extinct.

5. The Schedules of Reinforcement - Ratio schedules depend on the number of responses required per reinforcer to establish and maintain behaviour. Interval schedules depend on the time between responses and reinforcement.

Skinner's instructional techniques are still popular in education today and his theory has influenced programmed instruction as well (Markle 1969, Skinner 1968). For programmed instruction to align with Skinner's theory it must comply with the following: 1) practice should be presented as question-answer frames that reveals the subject to the student in steps, 2) the learner should be prompted to make a

response for every frame and receive immediate feedback, 3) the questions should be arranged in order of difficulty such that the response is always correct which leads to positive reinforcement, 4) good performance in the lesson/exercise must be paired with secondary reinforcers such as praise, prizes and good grades (Chen 2011: 1263).

Robert Gagné, Human Learning and the 9 Events of Instruction

Gagné, Briggs & Wager (1974) identified three categories of human factors that affect learning.

Table 11: Categories of human factors affecting learning

Major Categories	Human Factors
External Stimulus Factors	Contiguity – time relationship (time span) between stimulus and response Repetition – frequency of exposure to a stimulus Reinforcement - follow-up to the stimulus
Internal Cognitive Factors	Factual information – from memory Intellectual skills – ability to manipulate information Cognitive strategies – ability to process meaningful information
Internal Affective Factors	Inhibition – reluctance to react to stimulus Anxiety – tension (Often times people who are unfamiliar with a new type of technology, software or user interface experience inhibition and anxiety when they have to interact and use it.)

(Source: Chen 2011: 1264)

Each new skill which a learner learns must build on a pre-acquired skill. When designing instruction the prerequisite lower-level skills and knowledge must first be explained (Chen 2011: 1264). Robert Gagné (1916-2002) emphasised the importance of implementing positive reinforcement repetitively. He identified nine events of instruction as elements of a good lesson (Gagné 1996):

- **Gain Attention** by presenting a new situation or challenging problem/ question.
- **Inform learners of the objective/ describe the learning goal –** explain which learning outcome statements apply and what they entail.
- **Stimulate recall of prior learning-** provide a quick recap of the previous lesson/topic.
- **Present the content** and chunk information in micro-content units to avoid memory overload.
- **Provide learning guidance** such as helpful commentary, tips or hints.
- **Elicit performance-** give opportunity for learners to practice and apply new knowledge.
- **Provide feedback –** give a step-by-step solution to the problem and helpful advice
- **Assess performance** – award an assessment mark for the exercise with praise
- **Enhance retention and transfer –** let learners review the lesson, redo the exercise or give additional opportunity for practice. Inform the learner about similarly formulated problems.

When designing instructional materials for an m-learning environment it is important to follow and incorporate these steps so that learning outcomes can be achieved.

Behaviourist Theory Visible in Gamification and Video Demonstration

In a traditional classroom setting the teacher is responsible for creating the stimulus to achieve a desired behavioural response from a learner. Behaviours are adjustable and it is through the observed changes in behaviour that learning is measured. In practice, teachers often resort to punishment and threats to achieve desired behaviours in learners.

An e-learning system side-steps the public embarrassment of not passing a grade or failing at an assessment. Learners only compete with themselves. The learning content can be presented as games to keep learners engaged and interested in the materials. Drill and practice programs that are fun, interactive and novel can help cultivate new learning habits. Learners will be able to progress to the next level of difficulty in a task as soon as they have mastered the easier essentials. They can thus advance faster (they are not viewed as being on a fixed/same development level as everyone else). Because the online material is available on a mobile phone, the device acts as a medium for motivation and even initiative. Where the teacher was traditionally solely responsible for creating stimulus, the learner can contribute for improvement. A punish-and-reward association becomes redundant and collaboration becomes growth.

If one takes a behavioural perspective of learning through video games, then learning takes place accidentally/co-incidentally (Tanes 2016: 168-169, 175). A learner can unintentionally click on the screen to receive either positive or negative feedback prompting him/her to modify his/her behaviour. Learning occurs through trial and error when the learner is actively engaged with the educational game (Burton, Moore & Magliaro 2004). Learners must apply their prior knowledge and experience of previous trials so that they can minimise future error. This transfer of prior knowledge to similar contexts makes learning easier over time and helps for learning to endure.

According to Muneja (2015: 20) the Tanzanian secondary curriculum currently fits that of a knowledge-based curriculum (KBC) in practice. Learners are taught to perform in examinations (which is theory based) and are not trained for competency which is more skills based and in demand in the job market. Most South African schools do not teach a competency-based curriculum either. Learners are taught from textbooks and lessons take place where learners must sit quietly behind desks, take notes of teacher lectures, complete written assessment tasks/practice questions and finally study hard to pass the final examination and achieve good marks. Other than a few elective subjects such as art and woodwork (for boys) or home economics (for girls) – which aren't offered at all schools due to financial constraints, lack of infrastructure and no trained available teaching staff - there are really very few hands-on types of classes/subjects for students to choose from.

I would have been grateful if my school career taught me how to fix a light bulb and a leaking tap and how to change a flat tyre. Other helpful and practical life skills not taught at school level include basic drilling, how to set up a television and connect other devices to it and what the inside of a computer looks like. These types of skills were never taught at any of the schools I attended. Neither did I understand much about personal financial planning, how to make investment choices, lease a property or buy a good car. These are crucial life skills a person needs to know about when they complete school. Fortunately there are now many practical You-Tube videos and step-by-step guides available on the internet to help people solve every day, do-it-yourself types of problems.

Learning through Play

John Holt (1967) gives much needed insight into children's natural ways of learning. These are so simple that they are often disregarded in traditional education settings where the classroom is restrictive and rule bound. I discuss them briefly below, by referring to a summative blog post of Gray (2018).

1. **Children live in the moment, they do right now what others in their world do and through doing they learn**. They do not choose to learn things in order to do things in the future. Whole and meaningful educational activities should be structured for children/learners to participate in actively (this includes reading, writing, problem-solving, playing and creating). Leaf (2018) writes about mirror neurons in the human brain that enables learning by imitation (Rizzolatti & Craighero 2004). According to Acharya & Shukla (2012) mirror neurons' involvement in intention understanding has been supported by an fMRI (functional magnetic resonance imaging) study. The study illustrates that actions embedded in contexts resulted in selective activation of the mirror neuron system. The mirror neuron system has also been shown to activate and enable emotions of empathy.

2. **Children go from the whole to parts in their learning, not from parts to whole.** One of the biggest mistakes schools make, according to Holt is to break down tasks into components and then try to get children to practice the components in isolation from the whole. In effect schooling turns that which is meaningful and exciting into something meaningless and boring, but children are inherently very clever and can pick up components naturally and incidentally through play (Gray 2018).

3. **Children learn by making mistakes and then noticing and correcting their mistakes.** Children are inherently motivated to do those things that others do and to do it well. Holt (1967: 34, 198) explains that young children have what could be called an instinct of Workmanship. Adults tend not to see this, because children are unskilful and their materials are crude, but when children are not bribed or bullied, they want to do whatever they are doing better than they did before. Unfortunately schooling and poor parenting by adults tend strongly towards correcting children and pointing out their mistakes (believing this will help them learn). But in effect the child is belittled and caused to feel judged and anxious, thereby actually taking away some of his/her fearlessness to try a new activity. When a child starts an activity, the child cannot worry about mistakes, because to do so would make it impossible to start (Gray 2018). Holt points out that we need not correct children all the time. "Left alone, not hurried, not made

anxious, she was able to find and correct most of the mistakes herself" (Holt 1967: 140).

4. **Children may learn better by watching older children than by watching adults**. Children are very aware of the ways they are not as competent as the adults around them and this can be a source of shame and anxiety, even if the adults do not make a big deal of it. "Parents who do everything well may not always be good examples for their children, sometimes such children feel, since they can never hope to be as good as their parents, there is no use in trying" (Holt 1967: 182). This is why in certain circumstances children may learn better by watching somewhat older children than adults. There is much value in age-mixed play. Unfortunately, as Robinson (2010) explains, schools still educate and graduate learners in same-age batches, which is really an unnatural situation which hinders learning and development. An e-learning system is not structured according to the ages of learners. Anyone can enrol for a course irrespective of their age group.

5. **Children use fantasy not to get out of, but to get into the real world (Holt 1967: 228). Fantasy provides children the means to do and learn from activities which they can't yet do in reality**. In fantasy games children often choose roles that exist in the adult world around them, and in their play, they model their understanding of what adults in those roles do as close as possible. This is an extension of Holt's first point that children learn by doing what they do right now. In fantasy, the child can, right now, do things that nature or authority won't permit him/her to do in reality.

6. **Children make sense of the world by creating mental models and assimilating new information into these models.** Holt and Piaget have pointed out that children are tiny scientists that develop hunches (hypotheses) and then test them and accept, modify or reject those hunches based on experience. But the motivation must come from within the child, it cannot be imposed (Gray 2018). Holt illustrates an example where children were allowed to just 'mess around' with balance beams and pendulums when they wanted to. They learned much more in a lasting way about the natural laws of balance and

pendulum action than those that were explicitly taught. Children also use mental models which they developed from previous activities to help them make sense of new ones.

Learners in the FET phase are older than the children mentioned by Holt (1967), but the principles are still applicable, in my opinion. An e-learning/m-learning system creates more freedom for learners. Teenagers will have more flexibility and autonomy to try out new concepts and experiment. I agree that lessons and content should be structured from the whole (big picture) to the parts (Holt 1967). Gamification and other 'playful' interactive educational materials can make learning feel more like play and fantasy (Holt 1967) rather than work. Via mobile, the learner only 'competes' against himself/herself and has the freedom to correct his/her mistakes in their own time (Holt 1967).

Creativity, Divergent Thinking and Innovation in Education

Creative thinking is often stifled when learners are pressured to memorize and reproduce large amounts of facts in limited time (Muneja 2015: 21). Subjects like Mathematics, Science, Accounting, Law and Biology do require a level of mastery and memorization of laws, formulas, rules, principles and facts before a learner can progress to the next level. The learner must grasp foundational concepts well enough and be able to apply them correctly before advancing to more difficult subject content. By not requiring a pre-determined level of mastery, one only lowers educational standards and proficiency of learners. The trick lies in the effective structuring and presentation of materials to learners, so that the learning experience is user-friendly, engaging and simplistic enough to hold the learners' interest and attention.

Land (2011), shares results from a study he performed to test the creativity of 1600 students (from 5 years age until they became adults). The results showed a substantial decrease in creativity as children reached adolescence. Land and Jarman (1993) opine that non-creative behaviour is learned. He motivates that creativity should be taught as a course in schools and educational settings.

Becoming creative is an 'unlearning' rather than a learning process (Naiman 2014). People who think innovatively and creatively, find new ways to apply and use limited resources and they approach problems authentically. Land (2011) identifies two types of thinking in people, which are: divergent thinking (imagination for generating new possibilities) and convergent thinking (when making a judgement, making a decision, criticising, testing, valuing). Traditional, industrialised education un-learns divergent thinking in children and buries creativity under increasing rules and regulations. Children are moulded to follow instructions and conform to norms. In the process they learn to judge, criticise and fear their own ideas and de-value their own opinions.

Robinson (2009) observes that young children will take a chance if they don't know something, but as a child progresses through school she/he becomes conditioned into a set frame of mind (fixed mind-set) which makes him/her scared of being 'wrong' to such an extent that they refrain from taking any initiative. I agree with Robinson (2009) that children are progressively educated from the waist up as they become older. This has negative health implications (cardiovascular disease, muscle degeneration and poor blood circulation, diabetes, obesity, heart & liver disease and metabolic syndrome) (Reynolds 2015, Runtastic 2017, Berkowitz & Clark 2014)).

Robinson (2010) notes the uphill battle when it comes to innovating in education. Innovation is hard because it challenges the way things have always been done, that people accept out of habit and comfort. He explains that we need to let go of our 'linear, manufacturing, fast-food' model of education and reconstitute our sense of ability and intelligence, because it is impoverishing peoples' spirits and energies. I like his metaphor of "creating a movement in education in which people develop their own solutions, but with external support based on a personalized curriculum" (Robinson 2010). I also see potential for South Africa and Africa if we move towards an agricultural model (Robinson 2010) of education, which cultivates learners' dreams.

An e-learning system with a supporting framework can create an opportunity for teachers throughout Africa to work together to develop new curriculum content that empowers students and help them grasp subject principles and concepts faster for

proficiency. Short, self-paced creative and practical modules can develop creativity, innovative thinking and skills-building among learners. Another objective of education is to transfer useful knowledge from the past to younger generations. Lessons (via online/mobile) can be used as vehicles for transferring cultural heritage (Sahan & Terzi 2015: 1268).

Summary

To summarise the main elements of behaviourist theory, I refer to Chen (2011):

1. The content is divided into smaller units (micro-chunks)

2. Student work is checked often and feedback and encouragement (positive reinforcement) is given regularly

3. Students master the content to provide the correct response

4. External rewards are given

5. Knowledge involves remembering information and applying prior knowledge from trial and error learning

6. Understanding entails recognising existing patterns

7. Applications require 'transfer of training' which prescribes 'common elements' among problems.

According to Chen (2011: 1276-1277) these attributes can be incorporated into an educational application for computers and thus also mobile devices. It remains very important that educators, curriculum developers and content creators are aware of how learners learn naturally and to value and respect learners' inherent curiosity and creativity. Learning materials should incorporate and encourage innovation, experimentation and out-of-the-box thinking and doing by learners.

3.3.2. CONSTRUCTIVISM

Introduction

Constructivist epistemology says that people construct knowledge through a process of active discovery by assigning meaning to their current experiences from their personal standpoint, prior knowledge and experiences, individual mental structures and personal belief systems (Jenkins 2006). It presupposes that the source of a person's understanding of external circumstances and observations resides within his/her mind and the mind determines the individual's responses to phenomena (Jenkins 2006: 196). The mind is instrumental in interpreting events and objects and forming perspectives to establish an individual's distinct knowledge base.

The Learning Process, Learner Readiness and Multiple Intelligences

Learning is always an active process which can be practical (hands-on) or mental. No two learners are identical even though they may have the same needs and share common experiences, therefore constructivist educators view learning as an individualised process or experience. The mind is a mediator between the learner and his/her external reality and a learner constructs reality in terms of his/her personal experiences, conceptual knowledge, procedural schemas, values, attitudes and preferred ways of knowing.

When information (as lecture or text) is presented to learners in a school setting, it might not be received as intended by the teacher/instructor. No matter how clearly a teacher/text presents information, it will never be received in precisely identical ways by all students. The accuracy of reception depends on several pre-existing variables within the learner such as their biological and experiential readiness, their developmental stage (Jean Piaget identified 4 distinct developmental stages - the preoperational, operational, concrete and abstract developmental stages), the learners' preferred learning styles, their language proficiency (Jenkins 2006: 197) and their environment.

Dr Howard Gardner of Harvard University, who is well-known for his theory of multiple intelligences, identified three levels of understanding in learners: the naïve learner, the traditional student and the expert. He affirms that if a naïve learner's misconceptions are not challenged by instruction, they remain with them, even throughout university (Jenkins 2006: 197), thus instruction should be designed and presented to uncover a learner's misconceptions and to provide applicable learning input to replace and transform misconceptions.

Much constructivist research revolves around comparing the approach taken by an expert/master learner to that of a naïve learner who is less informed and less experienced. An expert views a problem differently and initiates more sophisticated protocols. The strategies employed by experts become the goal behaviours of novices. Teachers should model expert performance/behaviour for students with the aim of all students eliciting the same strategies spontaneously. As student performance becomes more expert, less help from the teacher is necessary. As previously stated, an e-learning system can serve as a platform for recording expert teaching and presenting it to larger numbers of learners via their mobile devices.

Personal, Social and Cognitive Constructivism in E- and M-learning

Rutherford-Hemming (2012) differentiates between personal constructivism and social constructivism. Under personal constructivism, learning is constructed within the individual based on his/her prior knowledge, whereas social constructivism maintains that learning takes place in a social setting/environment when individuals dialogue about problems with each other. Cognitive constructivism emphasises the importance of prior learning and existent concepts when learning new content, especially in fields such as mathematics and science. In order to effectively apply cognitive constructivism teachers must know where the students are at a given learning point or what previous knowledge they possess (Kasemsap 2015: 5).

In an online environment this becomes easier as the application/program keeps track of learner progress constantly and automatically. The educator acts as a facilitator by making necessary resources available to learners and guiding their assimilation of

new knowledge and the adaption of old knowledge. Thus the online curriculum should be constructed for new material to be presented, sequenced and paced to accommodate the learner's current level of cognitive development taking into account his/her existing intellectual framework. Successful learning requires internal motivation from the learner. They must recognize and accept the limitations of their own knowledge and be willing to abandon or adapt existing beliefs. Students with different levels of prior knowledge perceive different aspects of educational examples that are critical for their learning (Guo, Pang, Yang & Ding 2012). An online /m-learning environment creates more opportunity for a type of individualised learning and interpretation of content. It can help to bring the knowledge of all learners to the minimum required level collectively.

William Perry and the Developmental Stages

William Perry (1913-1998), an American educational psychologist from the Harvard Graduate School of Education studied the cognitive and ethical development of undergraduate college students. His theory distinguishes between four developmental stages with nine accompanying basic positions from which an individual can interpret the world, namely: dualism, multiplicity, relativism and commitment (Hall 2013). When taking the dualistic position, a student perceives things as either true/false, right/wrong or good/bad. Knowledge is received, not questioned and teachers are viewed as authority figures that provide the correct answers and impart the truth. Under the position of multiplicity learners recognize that things are right or wrong within a specified context. The truth is viewed as relative to a certain frame of reference and not absolute. There may be more than one solution to a problem or no solution at all and students become aware that their opinions matter and impact on outcomes. Under relativism (Hall 2013) knowledge is regarded as contextual and students judge viewpoints with regards to the source and supporting evidence, even experts are subject to enquiry. The position of commitment entails the integration of knowledge from outside sources with students' personal experiences (in work, relationships and otherwise) and reflection. Students commit to values that are important to them and they learn to take responsibility for committed beliefs. Each person partly determines his/her own future and fate and

understands that knowledge acquisition is an ongoing activity. Thus personal identity and life commitments are continuously changing and evolving.

Lev Vygotsky and Social Constructivism

Lev Vygotsky (1896-1934), a Russian psychologist and founder of social constructivism disagreed that learning can be detached from its social context, but believed all cognitive functioning originates in, and should be seen as products of a person's social interactions. Vygotsky held that children's learning and development are not pre-established by heredity (as per nativist theory), conditioning (as per behaviourist theory), or the child's independent active discovery (as per personal constructivist learning), but instead it is formed as the result of adult mediation (Karpov 2014: 9). Learning is the process by which an individual becomes integrated into a knowledge community and Vygotsky stressed the importance of language and culture in people's intellectual development and how they perceive reality. Vygotsky identified two developmental levels of individuals. Actual development is the level of development that a learner already possesses and can apply independently. Potential development is the level of development that a learner can attain with assistance from an educator/instructor (the level at which learning takes place). Through collaboration and interaction with others, learners are assisted to progress beyond their Zone of Proximal Development (Mukhari 2016: 39).

Knowledge Types and Relevant Skills needed for the 21st Century

Karpov (2014: 129-135) distinguishes between four types of knowledge:

1. **Factual knowledge** – knowledge of concrete facts, names, dates etc. Factual knowledge is important for understanding a text or memorizing new information. Studies have indicated that children may memorise new facts even better than adults if these facts are from a subject/field in which they are more knowledgeable than the adults.

2. **Conceptual knowledge** –knowledge of concepts, principles and theories. Conceptual knowledge provides learners with definitions and/or descriptions of classes of objects and phenomena.

3. **Procedural knowledge** –knowledge of skills, strategies and techniques. By itself procedural knowledge is relatively meaningless. Although students know how to do something, they might not understand why the procedure works or when it should be applied. Research has shown that in many cases students don't understand why the mathematical procedures they learn in school work. They leave school with computational skills to solve standard problems, but they lack the higher-order mathematical understanding (big/whole picture thinking as per Holt 1967) that enables them to apply the skills widely in novel situations. Oftentimes math instruction produces students who can manipulate number symbols, but they don't understand what the symbols mean. By teaching students conceptual knowledge together with a subject domain procedure, it makes the procedure meaningful and transferable and students become capable of applying the procedure in new circumstances to solve relevant subject domain problems.

4. **Metacognitive knowledge** – this is learners' ability to regulate themselves, plan and monitor their learning behaviour and evaluate the outcomes. Studies with intelligent novices (people with good metacognitive knowledge but no subject domain knowledge) have indicated that people could successfully learn by themselves in an absolutely new subject domain.

Meriläinen and Pïïspanen (2015) warn that today's education system faces irrelevance unless the gap can be bridged between how students live and how they learn. It is essential for schools to move from only teaching curriculum content knowledge to teaching learners life skills essential for success after school and in future society. A multi-dimensional education that integrates essential 21st century skills with knowledge will serve learners better than only a huge amount of detailed information (Meriläinen & Pïïspanen 2015: 69). The learning skills types are categorised into 3 areas as illustrated on the following page.

Table 12: Learning skills for the 21st Century

Information and communication skills	Thinking and problem solving skills	Interpersonal and self-directional skills
Information and media literacy skills	Critical thinking and systems thinking	Interpersonal and collaborative skills
Accessing and managing information	Exercising sound reasoning	Demonstrating teamwork and working productively with others
Integrating and creating information	Making complex choices	Demonstrating and the ability to adapt to varied roles and responsibilities
Evaluating and analysing information	Understanding the interconnections among systems	Exercising empathy and respecting diverse perspectives
Communication skills	Problem Identification, formulation and solution	Self-direction, monitoring one's own understanding and learning needs
	Ability to frame, analyse and solve problems	Locating resources

(Source Meriläinen & Piispanen 2015: 70)

An e-learning system provides communication channels for learners to seek advice from subject experts. Fast feedback systems serve to monitor progress, motivate and keep learners on track. The e-learning system can be viewed as a mentorship tool that can supplement/ complement a learner's school education.

This e-learning system is also supported by connectivist theory as the following section will show.

3.3.3. CONNECTIVISM

Introduction

Siemens (2005) and Downes developed the connectivist learning theory for the digital age. Connectivism maintains that knowledge is distributed across a network of connections and learning is the ability to construct and traverse those networks (Downes 2012: 85). Continuous learning has become a way of existence for many people and they have to keep open attitudes, be adaptable and stay abreast of new developments and research discoveries being made all the time. Connectivist learning environments allow individual autonomy to learners to contribute according to their own knowledge, values and decisions and to advance interactive knowledge production (Thota 2015: 85). According to Kop (2011: 20) there are four types of activities that drive learning in a connectivist setting 1) the aggregation of resources, 2) relating new knowledge to old, 3) the creation and production of artefacts to show learning, and 4) insight-sharing among learners.

How Fast Technology and Large Volumes of Information Impacts Learning

Siemens (2005) explains that the world's total knowledge doubles every 18 months with a brief time span before redundancy occurs. He observes that learning and work related activities are becoming more common and integrated. Post-millennial learners will change often between different (and unrelated) fields during their careers and technology has enabled learners to study diverse fields simultaneously. Vast increases in information have made it difficult to determine what information to select for use and which to disregard. Computers have processing speeds and storage capacities that outperform the human brain by far. This can be daunting for humans to come to terms with and use optimally for their benefit. Learners thus need to be skilful in differentiating between valuable and irrelevant or low quality content and know how to form a substantiated opinion about the information they obtain.

Siemens (2005) contends that technology alters the human brain and shapes our thinking processes leading to different learning trends amongst people. It has now

become more important to know where to find relevant knowledge than being able to recall the exact 'what or how' facts (as emphasised in past cognitive theories). In today's networked society it is necessary to determine the worthiness and value of learning something prior to commencing the learning process. People should also be comfortable with drawing information outside of their primary knowledge base. The skill of recognizing patterns and synthesising knowledge are very appropriate skills for the new age of learning as technology has taken over many of the cognitive operations previously performed by learners (take for instance the built in calculator application which is available on all smart phones). Today millions of people are dependent on the 'Google search' function to obtain information and answer all kinds of questions. It is clear that effective management of knowledge is crucial and an e-learning system can become a useful management and storage hub where the most recent and relevant information is kept and made available to all connected learners and other stakeholders.

Knowledge, Learning Networks and Learner Autonomy

Siemens (2005: 3) observes that the learning theories of behaviourism, cognitivism and constructivism are based on the physical presence of the learner and his/her brain-based learning processes. It focusses more on how learning occurs and does not address the value of what is being learnt or how learning takes place within organisations. These traditional theories fail to recognize that learning can be manipulated and stored by technology. According to connectivist principles (Siemens 2005: 3), knowledge rests in the diversity of opinions and learning may reside in non-human appliances. It is therefore more important to have the capacity to learn rather than possessing current knowledge which can become outdated quickly. A core-skill is the ability to see connections between fields, concepts and ideas. By guiding the implementation of an e-learning system which makes educational materials available to learners via mobile devices, the new proposed e-learning framework will incorporate these principles so that education can remain relevant in the midst of rapidly evolving information ecology (Siemens 2005: 3) without sacrificing a necessary level of mastery for progress.

A concern raised regarding connectivist theory, is that the direction of learning within an unstructured connectivist learning space is often influenced by 'network leaders' who shape emergent knowledge. Those learners that are not self-directed or don't have high levels of creativity and innovative thinking are often left confused by the goals of the course and the large volumes of available information (Anderson & Dron 2011, Kop 2011). Some people experience autonomous learning as a lack of support, and openness can result in certain participants disengaging or refraining from sharing information and knowledge. Bell (2011: 112) contends that 'connectivism alone is insufficient as a theory to inform learning and its technology-enabled support in an internetworked world.' According to Bell (2011), connectivism is an influential phenomenon that inspires teachers and learners to change their habits and practices, but more qualitative studies need to be done to inform its development within the context of other theories.

Summary

I agree with Siemens (2004) that decision-making in itself is a learning process. And decisions are based on rapidly altering foundations. An answer might be correct now, but it may be wrong tomorrow due to changes in the information climate affecting a decision. The learning theories of behaviourism, constructivism and others were developed in a time when learning and communication was not impacted by technology to the extent that it is today. Knowledge that resides in a database (such as an e-learning system database) needs to be updated continually and connected with the right people in the right context to be classified as learning (Siemens 2004). As knowledge continues to expand and evolve, it becomes more important for learners to be able to connect and plug into the right sources. Access to what is needed is more crucial than what the learner currently knows. Learning tools (such as mobile devices) enable learners to connect, retrieve, create and share knowledge in this digital era much more easily and instantaneously.

3.4. THE BENEFITS OF MOBILE EDUCATION

Kraut (2013: 9-26) highlights 13 unique benefits of mobile learning. Benefits such as expanding the reach and equity of education, facilitating personalized learning, immediate feedback and assessment, anytime anywhere learning and building new communities of learners have already been discussed in some form previously, therefore I only mention those not yet addressed in this study

1. **Mobile learning can help ensure the productive use of time spent in education**

   Learners can use mobile technology to complete passive and rote tasks (listening to a lecture, memorizing information at home etc.) which then gives them more opportunity to discuss ideas, share opinions and work collaboratively with peers in other learning environments (the classroom, learning centres etc.)

2. **Situated learning is supported**

   Learning can be moved to settings that maximise understanding like museum trips with audio guides. 'Site-specific' mobile applications can be used to enhance learning in fields such as chemistry. Mobile applications can assist users/tourists in cities by pointing out architectural landmarks, their design and significance. Botanical applications can help botany students learn about particular plants while inspecting them in their natural habitats (Kraut 2013: 18).

3. **Seamless learning is enhanced**

   Cloud computing and cloud storage helps to streamline education by providing learners with continuous up-to-date learning experiences regardless of the hardware they use to access content. The educational resources and data about learner progress are stored on external servers instead of on the hard drives of individual devices of learners. Thus, they simply need connection to the internet

and applicable synchronising software on their device to access the materials and participate in the learning experience.

4. Formal and informal learning are bridged

Students can easily obtain supplementary materials via online searches to clarify concepts taught in the formal education program. There are already many different language applications such as Duolingo ,Babbel, Memrise and Busuu that can 'listen' and 'speak to' students via the speaker and microphone in their mobile phone. Audiobooks are also becoming more widely available.

5. Education disruption can be minimized in conflict and disaster areas

It is generally easier to repair mobile infrastructure after a conflict or natural disaster than it is to repair and reconstruct physical infrastructure such as school buildings and roads. Mobile devices can help to ensure the continuation of education that is unbroken. By making educational disruption less severe in post-conflict and post-disaster areas, recovery can be speeded up and fragile societies restored.

6. Learners with disabilities can be assisted

Text-enlargement, voice-transcription, location-aware and text-to-speech technologies can help to improve the learning of students with physical disabilities.

7. Communication and administration can be improved

Instant email and messaging enables faster, more reliable and less expensive means for communication than traditional snail-mail (post) and paper-and-ink based materials. It is also environmentally more beneficial.

8. **Cost-efficiency maximisation**

Mobile technology and resource provide good value for money when compared with other educational resources. It can become costly to purchase, procure, deliver and update physical textbooks continually. Many governments have leveraged the technology people already own, rather than providing new devices to expand educational opportunities successfully.

Continuous technological advances have helped to reduce previous difficulties such as small screen sizes, energy sources and power capacity in various developing countries (Kraut 2013). There is lower societal resistance to use mobile phones in formal education and successful mobile learning projects can serve as exemplars for large-scale initiatives. Continual pressure is being placed on educational institutions to provide high-quality education at low cost. The rise of online/distance education and new procurement and distribution channels for digital learning resources (Aluko 2017) makes this an exciting time for mobile education in South Africa and Africa. According to Kraut (2013) mobile technologies will never be a cure-all for every educational challenge, but mobile learning is evident in many developing countries and it can expand and enrich educational opportunity for diverse learners in diverse settings.

3.5. CONCLUSION

This chapter elaborates on behaviourism, constructivism and connectivist learning theory as appropriate educational theory to underlie and support the proposed e-learning framework for mobile devices in Africa. Specific benefits of mobile learning are also highlighted.

Chapter 4 discusses the research design and methodology followed. The chosen research paradigm is explained and the ethical requirements pertaining to this study are elaborated upon.

CHAPTER 4: RESEARCH DESIGN AND METHODS

4.1.   INTRODUCTION

The purpose of this study is to propose an e-learning framework for instructional design for mobile devices for the FET phase in South Africa and Africa. In order to achieve this purpose, behaviourist, constructivist and connectivist learning theory, were clarified in detail in Chapter 3.

Chapter 4 details the research paradigm, design and methodology for the planned study to achieve the main research aim. Ethical considerations are also addressed.

4.2.   RATIONALE FOR THE RESEARCH STUDY

Due to global ICT, virtual environments and societies have come to exist via the emerging and evolving technology. First world students and researchers publish and share discoveries, research results and newly developed ideas for global consumption via the World Wide Web in the form of blogs, podcasts, online videos and journal articles.

From the growth perspective as detailed in Chapter 1, Africa is often referred to as an emerging market. Its separate countries exhibit a complex multitude of languages and traditions which necessitate alternative tuition and standardization towards prosperity. Distance communication has become instant and latest research results speed across the internet. An explanation of every conceivable concept can now be obtained via mobile devices.

Countries need a globally accepted compass to steer education to be current, anticipatory and sufficient. Harari (2016: 101, 356) motivates for the establishment of a new paradigm. He writes that technological and artificial intelligence progression will result in humans losing their economic and military usefulness and that the

political system will stop attaching value to them. He also equates our sensations, emotions and desires to that of highly refined algorithms determining ninety-nine percent of human decisions including important life choices like careers, spouses and habitats. Eventually our organic neural networks could be replaced by intelligent software (Harari 2016: 52). These futuristic developments might occur faster than we think and education institutions become like heavy ships that move slow in comparison. I agree with Oliver (2015: 31-33) that the challenge lies in utilizing "new developments in the e-learning environment for effective assessment tools".

Higgs, Van Niekerk, and Van Wyk (2010: 136) assert that curriculum development in Africa needs to be rethought in the context of the developments taking place in Open Distance Learning (ODL). An e-learning framework for mobile education instruction forms a crucial part of this process to address standardization of alternative tuition.

Personally I have experienced problems relating to curriculum changes both as student and teacher. If a student changes schools, the terminology and style of education varies. Students have a lack of fluency and depth in the understanding of a subject. A mobile application can ensure standardisation across borders. I have experienced in the tuition of Mandarin, for example that digital learning programmes are not equally user friendly and a quality, easy to use mobile application can facilitate this. Because South Africa is a multi-cultural and multi-lingual country students are often obligated to study in their second or third language. Digital programs are developing advanced translation capabilities to facilitate the individual. It thus becomes easier to grasp content without language barriers.

In many South African schools Maths and Science are taught at a snail's pace and too simplistically to live up to the demands of achieving higher grades. An article in the Economist (South Africa's schools 2017) reports on South Africa's low ranking in the 2015 Trends in Mathematics and Science Study (TIMSSSA 2015). Time constraints and disruptive conditions in schools limit practicing time for students to master their skills.

An online education system/portal and mobile application where all the main CAPS (DBE 2018) subject topics are available as short pre-recorded lessons and multiple

choice assessment tasks can help learners achieve better outcomes. The mobile application should only give access to the next level of difficulty when the required level of efficiency has been reached. This application can provide continuous extra exercises for learners until they attain the required proficiency. A current example of such a type of software application is the Readers are Leaders program. It is South Africa's leading computer based reading and language programme and offers a wide spectrum of English and Afrikaans stories for learners from grades 1 to 12 and tertiary level. There are more than 1000 reading passages available with sequenced exercises covering all language aspects such as grammar, vocabulary and spelling. Learners can work independently and at their own pace while improving their reading speed, comprehension and academic performance. Their website: http://readersareleaders.co.za/ contains further information for schools and individuals interested in what they have to offer.
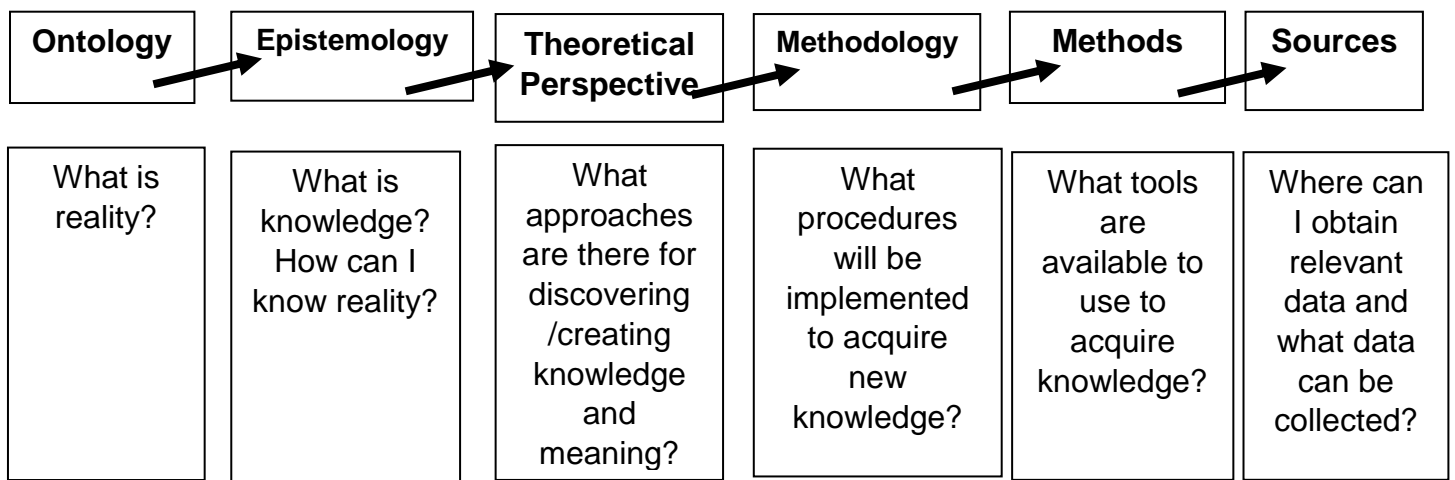
Zawacki-Richter, Brown and Delport (2009) are also in accord that our technologically advanced society, international open education systems and broad communications networks call for a paradigm shift. Old ways of contemplating reality and perceiving knowledge does not suffice anymore. Information is produced at faster speeds and things can change in an instant. It therefore becomes crucial to continuously keep an open mind, be flexible in your thought processes and keep expectations adaptable about what is possible in education and instruction today. Peters (2004: 25) states that a paradigm shift in education might mean certain educational models or patterns no longer exist because they have been replaced by newer and different versions. Very often in the field of education, the change is not a transitory process under investigation but a sudden and abrupt one.

4.3. RESEARCH PARADIGM

A research paradigm is a fundamental frame of reference (Babbie 2010: 31). Where a theory attempts to explain, a paradigm presents a way of looking at it. It describes a selection of beliefs and prescribes what should be studied, how research should be conducted and the results interpreted (Bryman 2012: 630). It is a pattern with a set of legitimised assumptions and a design for data collection and interpretation (De Vos,

Strydom, Fouche & Delport 2011: 513). It is based upon a basic set of first principles (unconditionally accepted beliefs). Bezuidenhout et al. (2014: 19) explain that in the social sciences, research paradigms are referred to as worldviews or research traditions. Research paradigms are determined by their unique ontology, epistemology and methodology. Patel (2015) presents a flow diagram to illustrate the relationship between these concepts. It has been adapted slightly below:

Figure 7: The Components of a Research Paradigm and Scholarly Research

Ontology	Epistemology	Theoretical Perspective	Methodology	Methods	Sources
What is reality?	What is knowledge? How can I know reality?	What approaches are there for discovering /creating knowledge and meaning?	What procedures will be implemented to acquire new knowledge?	What tools are available to use to acquire knowledge?	Where can I obtain relevant data and what data can be collected?

Source: Adapted from Salma (2015)

Ontology

Ontology concerns the nature of reality (Staller 2010: 1159) and ontological questions interrogate fundamental conceptions of what is real. Researches can choose to take the perspective of realist or relativist in this instance. A realist perspective sees reality as 'out there' and as a law of nature, whereas a relativist perceives reality as a socially constructed concept or shared experience which is open to the individual interpretations of people, as determined by their personal value systems and unique frames of reference. This study relies on a relativist perspective.

Education changes as society and its values change, sometimes for the better and other times for the worst. For example: mixed opinions were expressed by South

African citizens and communities regarding the Johannesburg High Court ruling last year that schools can't promote a single religion anymore, but have to allow students the freedom to choose for themselves (Mabuza 2017, High Court 2017).

Our world has become one of 'ideas' and 'voices'. Internet development and technological advancements make it easy for people to organise themselves into groups and drive agendas. Individuals have personal creative power never experienced before. We can write and distribute opinionated blogs, design websites according to personal preference, publish electronic books, share and distribute photos, digital works of art, create and record music and advertise a product/business. We are now even able to 'fluke' reality by designing virtual worlds and experiences for others to participate in. Computer-modelling, virtual tours like Google Expeditions (https://edu.google.com/products/vr-ar/expeditions/) and photo- and video demonstrations can show learners what a place (destination/world heritage site) or thing (the inside of the human body) looks like. They no longer need to rely only upon their imagination (which often doesn't portray reality accurately) to try and make sense of abstract words and sentences written on a two-dimensional piece of paper (many textbooks have very few colour images at all).

The world and reality is changing very fast and education should adapt accordingly. In order to remain relevant, it is proactive to develop an e-learning framework and effective e-learning system to incorporate technology and multimedia tools for maximum benefit of African learners.

Epistemology

According to Hofer and Pintrich (1997), epistemology is a branch of philosophy concerned with the nature and justification of knowledge. It refers to a theory of knowledge (Staller 2010: 1159). Epistemological questions examine how we know the world, what can be known and who can know. Bates (2015: 44) explains that the underlying beliefs and values an educator shares with other experts in a subject domain, shape his/her approach to teaching. These values and beliefs are often implicit and not shared directly with students, but they are essential to becoming a subject expert in a field. Different theories of learning reflect different views on the

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nature of knowledge. Academic knowledge is distinguishable from other knowledge forms, but it is not the only kind of knowledge important in today's society. Educators must be aware of other forms of knowledge and the relevance of each type for students. Skills-based practical knowledge (like computer coding), experiential knowledge, common-sense reasoning, intuition and instinct are all types of knowledge and knowing that students need for the digital age.

Connectivist theory (as discussed in Section 2.5.3 in Chapter 2) suggests that the nature of knowledge has already changed due to the internet. The ability to manage knowledge, to lead and to exhibit emotional intelligence (EQ) has become more important than IQ only. Castells (2000) has put forward that knowledge is not an object, but a process (a series of networks and flows) produced via the interactions of people. Knowledge should not be viewed as a product in the individual, separate minds of people.

Lyotard (1984) posits that the traditional view of training the mind to acquire new knowledge would become obsolete. So too would the idea that knowledge is a fixed set of universal truths. Instead there would be many truths and forms of reason and the boundaries between traditional disciplines would dissolve as a result. The traditional ways of representing knowledge (through books, academic papers etc.) would become less important and the role that traditional academics and experts are required to fulfil will also undergo transformation. Connectivist theory asserts that learning can reside in non-human appliances and Downes (2007) has contested that new technologies allow for the de-institutionalisation of learning.

Knowledge, in my opinion, has more value to create positive change and innovation if it is shared rather than kept private. The ability to communicate knowledge effectively and confidently is an important skill that will serve learners in their careers and futures. Gilbert (2005: 67) aptly states that "today everyone, if they are to have a job, needs the kind of higher order thinking skills that only those in managerial or professional positions formerly needed. We can achieve this only through major structural reform in our education system". Effective decision-making is in itself a learning process and nurturing and maintaining connections is crucial for facilitating continuous learning (Siemens 2005).

Methodology

This includes the techniques, procedures and tools used to conduct research. As previously explained, this study is qualitative in nature. Case studies or quantitative analyses are not included. Document analysis is employed, and I also examine video and audio materials such as TED talks and You Tube videos.

Interpretivism and critical theory research paradigms are examined below to point out the commonality.

4.4. INTERPRETIVISM AND CRITICAL THEORY AS RESEARCH PARADIGMS

Interpretivists view reality as socially and experientially determined, intangible mental constructions. Burton and Bartlett (2009) explain that interpretivism embraces many different social perspectives. Society is not viewed as having a fixed structure, because the social world is created by the interactions of people. Norms and values are present, but they are changeable elements, influenced by peoples' interpretations and responses to events. The interpretivist paradigm seeks to understand the meanings behind peoples' actions (Burton & Bartlett 2009: 22). Detailed descriptions are given to create a 'feeling' for the environment (Burton & Bartlett 2009: 22). For this study no interviews or observations will be conducted, neither will ethnography be employed, but I refer back to past experience from teaching practice to support the document analysis informally.

Critical theory refers to the theoretical tradition established by the Frankfurt school (a group of writers connected to the Institute of Social Research at the University of Frankfurt) in the 1920's-1940's (Rush 2006). It has been influenced by the viewpoints of writers such as Horkheimer, Adorno and Marcuse (Kinchloe & MacLaren 2002: 87) whose political perceptiveness were impacted by the effects of World War 1 and post war Germany during the economic depression, high inflation, high unemployment and failed strikes and protests in Germany and Central Europe (Kinchloe & MacLaren 2002: 88). Today, there exists many critical theories and the tradition keeps changing and evolving.

Critical education theory is a branch of critical theory that looks at the social, cultural, political and economic context of compulsory State education to determine how education creates a community that accepts the status quo and directives as given by the Authority without criticism or challenge, ultimately serving the dominant culture of a society (Ward 2013a; Ward 2013b). Critical education theory includes critical pedagogy (a critical analysis of practices and existing power structures within educational settings), the hidden curriculum (how informal behaviours and structures within educational settings establish the subconscious learning of social control patterns), and curriculum studies (what may be taught and who controls the process by which specific types of knowledge is chosen above others or legitimation) (Ward 2013a; Ward 2013b).

Ward (2006b:2, 6) explains that a traditional school is one of the main places where children are taught to conform to social meanings and values. Schools have an ability to engender passivity in learners through the hidden curriculum (the informal regimes of discipline, timetabling and social order systems such as: sitting in rows, facing the teacher authority, same age companions, timetabled toilet breaks and prohibitions on unauthorised speech and public criticism/shaming) that establishes an acceptance of an external authority rather than personal sovereignty.

Ward (2013c) presents a chronological history of critical education theory with three distinct eras marking the changes in education's perceived social role, as identified by Young (1965). From the 1900s to 1945 education was seen as a means of social pacification, from 1945 to 1974 education was regarded a means of national economic productivity, but from 1974 to the present, education is viewed more as a national economic burden, where the costs of education outweighs their perceived usefulness to the system. Research indicated that no actual economic benefits at national level were evident despite increased educational provision. Instead, the increased levels of educational achievement simply increased the qualification demands of prospective employers, creating 'credential inflation' while working class students were still largely unrepresented at university entrance level (Collins 1981). I personally think that quality training/education is still an investment creating value as it can inform people and make them more effective, efficient and resourceful in their

jobs. It also serves a purpose to dispel ignorance and misunderstandings. But the curriculum, educational materials and content must be designed for these purposes specifically.

Common elements shared between both interpretivist and critical theory are that society is based on peoples' interactions and alternates continuously (Burton & Bartlett 2009) due to interpretation. The 'controller' of the curriculum has the power to influence and improve outdated norms, behaviours and social control patterns. Both discussed paradigms apply to the e-learning/m-learning era that changes rapidly and continuously due to technological developments. Therefore I consider both paradigms as relevant for this study.

Figure 8: Two Selected Paradigms
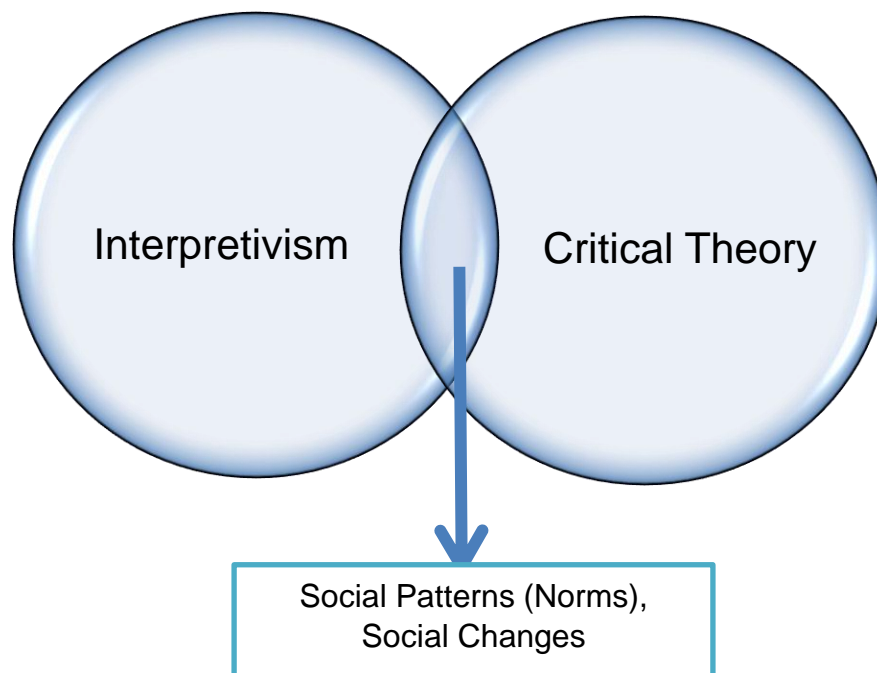
Where a paradigm is a fundamental frame of reference (Babbie 2010: 31), research design is the overall plan for collecting and analysing data to address research problems. Research design is discussed below.

4.5. RESEARCH DESIGN

As explained in Chapter 2, this research is an explorative study of existing data or, in other words, a systematic literature review of scholarly articles on m-learning and e-learning frameworks. It is non-experimental (I do not actively try to change situations or circumstances and no live participants are involved in this study) and comparative (e-education policy and strategy of various countries is compared). Thus the approach followed is qualitative. It is, in my view the most effective for achieving the research aims and addressing the research problems listed in Chapter 1 (Section 1.8). McMillan and Schumacher (2010: 321) identify characteristics applicable to qualitative studies, which are also relevant to this research.

A qualitative researcher must be sensitive to the immediate and larger context surrounding phenomena. Meaning is determined by social, political, racial, class, gender-based and technological factors. When comparing first and third world educational strategies and systems I endeavour to be contextually sensitive. Strauss and Corbin (1990: 42) point out a second, related attribute namely, theoretical sensitivity. A researcher should be aware of the subtleties of meaning of data and have insight in giving meaning to data so that what is applicable can be separated from the unappropriate. As a researcher, I acquire theoretical sensitivy by reading and consulting professional literature and referring back to professional and personal experiences.

In qualitative studies, the researcher acts as the data gathering instrument and invests time in direct interactions with the documents/objects being studied. Data pertaining to this study was collected by conducting internet (Google Scholar) and online library searches via the UNISA library portal. Considerable time was spent reading, reviewing and analysing documents.

All research was approached from the viewpoint that nothing is trivial, thus ensuring that no important information was omitted and complete analyses with rich narrative descriptions (explanations) were given. Yet, due to information-overload which shows itself as a real-time issue of our day, I simultaneously applied 'reduction of content'. 'Reduction of content' intends that only the most important facts remain to retain exemplar content.

This research is emergent in design and it evolved as the study progressed (Given 2008). A flexible approach to data collection and analysis was adopted. Research questions and aims were adapted in response to new information and insights gained (Given 2008). A complete account of the research methods was only performed retrospectively, after all the data had been gathered. Multiple data sources and perspectives were investigated to obtain as complete a picture as possible.

4.6. RESEARCH METHOD

Introduction

This study implements the systematic evaluation of documents and texts (Oliver 2015:39). Document analysis involves the examination and interpretation of data to elicit meaning, gain understanding and develop empirical knowledge (Corbin & Strauss 2008).

I performed secondary data analyses of existing databases as indicated in Chapter 1 (Sections 1.2 and 1.3) to motivate why an e-learning framework and e-learning system is necessary and how it can help address the educational backlog in South Africa.

The overall research aim is to propose an e-learning instructional design framework for mobile devices in Africa. The main research question (Chapter 1, Section 1.8.) asks what elements should be included in such a framework. In order to answer this question satisfactorily, a literature review (document analysis) of existent e-learning/m-learning frameworks was conducted. The criteria for selecting the information sources (as explained in Section 2.2.) stipulate that information must be 1) current and up-to-date, 2) relevant to e-learning or m-learning, and 3) the author must be referred to by another reputable authority (Cronje 2008). Each framework was analysed descriptively and evaluatively.

Chapter 1, sub-question 1.8.3 asks how education is regulated and managed in first and third world countries and what e-learning developments have taken place in these countries. To respond to this question, publications and education legislation of education ministries and national regulatory bodies were analysed and compared (please refer to Chapter 5, Section 5.2.4. for a tabular summary comparing education systems of the USA, Finland and Malawi). I also consulted the websites of national research institutions to obtain relevant data and reports for substantiation and complementary purposes.

The investigation and analysis of sources entailed: 1) performing a background study and description of each country's education system, 2) identifying key characteristics of each education system and structure, 3) performing a critical analysis of the elements and 4) comparing the systems to each other and to that of South Africa to make relevant recommendations. The reasons for choosing document analysis as research method follow below.

Why Document Analysis?

Bowen (2009: 29-30) pinpoints 5 functions of documents: 1) They provide data on the context within which research takes place, 2) information found in documents can indicate questions to be asked as part of the research, 3) documents provide supplimentary research data and can be valuable additions to a researcher's current knowledge base, 4) it is a means of tracking change and development and can be analysed to verify findings and 5) corroborate evidence from other sources.

Document analysis is effective for gathering data from mulitple sources rather than a limited number of participants only. It is also cost-effective and can save time compared to preparing and conducting new experiments or interviews and surveys for empirical studies. Many documents are freely available on the public domain. Documents provide broad coverage and contain exact data such as names and dates of events that took place. In this way historical facts and events which might have been forgotten already are accounted for.

It has become easy to manage and store documents online through storage facilities such as Dropbox and Google Drive. Documents are 'stable and non-reactive' data sources which can be read and reviewed multiple times (Bowen 2009: 31) . Documents cannot be altered through the research process or by the researcher's influence.

I employed document analysis to provide background information for contextualisation, to support and strengthen the research rationale and to derive research conclusions. My research archive contains a diverse collection of primary and secondary source documents such as: education policy and legislation, academic theses and journal articles relating to the research topic, newspaper articles, academic e-books and statistics reports. A primary source is a historically contemporary and/or first-hand account, whereas a secondary source is a historically distant and/or second-hand account (Rapley 2007b: 16-17). Academic publications such as theses and journal articles would fall under secondary sources and legislation/policy documents would fall under primary sources. Once applicable sources have been identified and selected, analysis and processing of content can occur.

Actions involved in Document Analysis

Analytical activity entails skimming (superficial examination), reading (thorough examination) and interpretaion of documents (Bowen 2009: 32). There are five strategies involved, according to McMillan and Schumacher (2010: 362):

1. *Locating the document*

    UNISA's library has many e-resources available and an online search with Google Scholar produces positive search results.

2. *Identifying the document and placing it in a retrievable form*
    Naming and saving a portable document format (pdf) version of an online journal article in an allocated folder on Dropbox.

3. *Analysing the document*
    Skimming, reading and deriving meaning from the text.

4. ***Criticising the document***

        Evaluating the document's relevence and applicability to the study and identifying any shortcomings.

5. ***Interpreting the meanings embedded in the document***

        Context and theoretical sensitivity apply here.

Important Considerations

Certain documents are not created with data research agendas and therefore the researcher must investigate and determine whether they are relevant for inclusion in the study. Continuous and rapid developments in technology could also exclude important documents from the study due to the incompatably of their formats with new software programs (De Vos et al. 2011) this would suggest an incomplete investigation or biased selectivity on the part of the researcher (Oliver 2015: 40). Some documents may be incomplete or the data could be inconsistent and inaccurate. Other documents might only provide partial useful information. Certain documents are inaccessible requiring subscriptions with fees attached. I evaluate all selected documents and sources based on the above mentioned quality prescriptions and identify gaps where additional information is needed.

4.7. ANALYSISING TEXTS AND PROCCESSING DATA

Freebody (2003a: 180-182) distinguishes between two broad analytic categories for anaylising text: linguistic approaches and sociological approaches. Linguisitic approaches focus on the application of grammar whereas sociological approaches investigate the ideological and cultural achievements of a text without giving much consideration to detailed taxonomic analysis of textual materials. According to Freebody (2003a: 181-183) texts should be viewed as objects that reflect and construct accounts of reality, but text should also be considered as interaction. I will take a sociological approach when investigating a text and make use of linguistical

principles to detemine the grammatical quality of the writing for inclusion in this study.

Hermeneutics refers to the theory of interpretation (Schwandt, 2005). The term is derived from the Greek verb *hermeneuein* which means "to say or interpret" (Chang 2010b: 20). The theoretical core of critical hermeneutics (Kögler 2008: 4) states that all direct, conscious acts of interpretation follow from an individual's indirect, general background understanding (knowledge). This underlying understanding has been mediated through language and is culturally and socially situated. In other words, understanding is exhibited through an individual's interpretation, but at the same time his/her understanding also shapes and influences his/her interpretation, which is constructed in language (Chang 2010b: 19). Language and its meanings in turn, have developed within a specific cultural and social context.

Objective hermeneutics was first developed by the German sociologist, Ulrich Oevermann in the 1970s. Wernet (2014: 238-243) outlines the basic procedure for reconstructing meaning from texts as applied in objective hermeneutics. The principles include:

1. Excluding the context at first so that the latent level of meaning of a text will not be overlooked.

2. Taking the literal meaning of the text seriously. This means that the researcher focusses on what was really written down or actually communicated instead of looking for what the communicator might have wanted to express, but didn't.

3. Sequential analysis. The text must be analysed line by line. A researcher need not start at the beginning of a text, but wherever they start with an interpretation they have to continue the interpretation with the sequence that follows so that a full cycle of reconstruction can be completed.

4. Extensivity relates to the in-depth and detailed analysis of smaller text segments. Often times only a part of the text is analysed and not the whole text, so that particular attention can be given to the most important information.

I will keep these principles in mind when investigating various texts. As mentioned earlier, I maintain a research archive from which only the most relevant sources are selected for analysis and evaluation. By employing content reduction, important facts and information are retained for inclusion in this study. The full investigative procedure was explained in point 4.6.1. of this chapter.

4.8.   ETHICAL CONSIDERATIONS

Hammersley and Traianou (2012: 16) describe ethics as a set of principles that address what is good or right so that we can identify what is bad or wrong. Qualitative research ethics addresses the integrity of the research activity (Preissle 2008: 276). Hammersley and Traianou (2012: 20) employ multiple overlapping contrasts to distinguish ethical activity from unethical action 1) The activity should pertain to something with ultimate and not only instrumental value, 2) Concern must be shown for the interests, feelings and rights of others, action should not be solely for self-interest, 3) Rules and principles must be observed consistently and action must be taken in the most expedient way within the given circumstances 4) The activity should align with 'higher values' such as self-realisation and the common good, rather than purely egotistical pursuits like financial gain and social status, 5) Action must be taken from a sense of duty and responsibility and not merely as a response to a personal desire or inclination and 6) Behaviour should be conscious and thoughtful, not impulsive.

This research aims to be of value to the academic scholars, educational practitioners, legislators and policy writers as well as school learners. I observe the guidance given by my academic supervisor and adhere to the principles of UNISA Policy on Research Ethics. Ethical clearance for this study was received from the College of Education at UNISA (please refer to appendix A). As researcher I am

responsible for recording findings and recommendations in line with the criteria of trustworthiness, dependability and transferability.

Qualitative research employs different benchmarks to establish qualities of credibility and trustworthiness (Bezuidenhout et al 2014: 258). A credible research study gives assurance that data has been properly collected and correctly interpreted so that the findings accurately reflect and represent the phenomena that has been studied (Yin 2016: 85). I select data from credible sources so that the findings are dependable. I also provide complete references so that data can be verified and confirmed.

4.9.   TRUSTWORTHINESS, RELIABILITY AND VALIDITY

Introduction

According to Lincoln and Guba (1985: 290) the concept of trustworthiness entails persuading the research audience that research findings are worth attending to. Yin (2016: 86) explains that trustworthiness mainly results from instilling an 'attitude' throughout the research process, and not necessarily following any specific procedures. Authenticity is very important in this regard. It must be evident that the researcher conducted the research him/herself and that it is his/her own work. The aim is to inject trustworthiness into the methods used to generate data rather than debating the inherent 'truthfulness' of the data (Gibson & Brown 2009:59). This research adheres to the principle of trustworthiness because authentic interpretations, opinions and findings were formulated by myself as researcher. The procedure for selecting, analysing, evaluating and comparing texts was explained fully under points 4.6.1, 4.6.3. and 4.7. of this chapter. By referring to these points, other researchers should be able to follow and replicate the research method and process. No plagiarism occurred and correct citations where given for all sources used.

Reliability is the extent to which research findings are independent of accidental circumstances and validity is the degree to which findings are correctly interpreted (Kirk & Miller 1986: 20). Reliability and validity concern consistency and meaningfulness of research results (Sykes 1990).

Data collection and analysis for this study did not involve live participants, neither was communications between individuals (such as emails, message texts or phone conversations) analysed or categorised (Harris, Pryor & Adams 2006). Informed consent and data 'coding' was therefore unnecessary. I do strive to remain consistent in perspective during data collection and analysis over time (Goodwin & Goodwin 1984), therefore the research does have a degree of intra-analyst reliability, stability and internal consistency. Research findings are shared with my academic supervisor for review, feedback and input.

Shenton (2004) provides provisions to address four criteria for trustworthiness of research, namely: credibility, transferability, dependability and confirmability.

- **Credibility**

According to Shenton (2004:73), a researcher can enhance the credibility of his/her research by adopting appropriate and research methods that are well recognised. I implement the recognised method of document analysis. Debriefing sessions were attended with my supervisor and she performed checks/reviews on the data collection, interpretations and findings. Rich descriptions of phenomena are provided to ensure nothing of importance has been left out and prior research on this topic is examined in order to frame research findings.

- **Transferability**

Transferability is the degree to which research results and analysis can be applied beyond a specific research project to another, similar situation and yield similar results (Bezuidenhout et. Al. 2014: 259). This allows for generalisation within a research approach. Shenton (2004:73) recommends that researchers provide background data to establish a study's context and give detailed descriptions of the phenomena in question for comparison of data. Chapter 1 of this dissertation describes the context of the study with supporting secondary statistical data. The main research question, component sub -parts and corresponding aims in Chapter 1, give the reader an understanding about the scope, depth and purpose of this study.

- **Dependability**

Dependability is a measure of the quality of the integration process between the data collection, data analysis and theory generated therefrom (Bezuidenhout et al 2014: 259). Shenton (2004:71) advises that dependability can be addressed directly by reporting the processes within the study in detail. This enables a future researcher to repeat the work. The research design then becomes a prototype that equips the reader to assess the degree to which proper research practices have been followed and to gain a thorough understanding of the methodology employed and its effectiveness. Chapter 3 details the research design and addresses the operational facets of data gathering. The final chapter of this thesis will include a reflective appraisal of the entire research study.

- **Confirmability**

Confirmability corresponds to the quality of objectivity in quantitative research. Steps must be taken to ensure that research findings result from the ideas of the informants (documents in this case) rather than the preferences and characteristics of the researcher (Shenton 2004). Confirmability pertains to how accurately the collected data support the findings and interpretations of the researcher and how

well the findings flow from the data (Bezuidenhout et al. 2014:259). Therefore it is imperative that the researcher describes the research process in full to enable others to scrutinise its design.

Other recommended actions to enhance confirmability include: the admission of the researcher's beliefs and assumptions, recognising the shortcomings in the methodology and stating the potential consequences (Shenton 2004).

A thorough description of the research design and methodology was provided in this chapter and mention was made of the shortcomings inherent in document analysis. Throughout the study, my opinions and beliefs are stated, but I employed reflexivity to consider how personal bias might affect interpretations.

4.10. CONCLUSION

This chapter covers the rationale of the study. Aspects pertaining to the research paradigm (ontology, epistemology and methodology) were illustrated and interpretivism and critical theory were considered as research paradigms. The selected research approach (qualitative design) and methodology (document analysis) were delineated and an explanation of the ethical requirements (trustworthiness, credibility, dependability and confirmability) pertaining to this research is provided.

Chapter 5 follows with an analysis of applicable South African education policies as white papers. A comparison of educational systems and legislation of the USA, Finland and Malawi is made to establish successful e-learning strategies or the lack of them, so that South Africa can implement what works. Finally, the proposed e-learning instructional design framework for mobile devices in Africa is presented.

CHAPTER 5: DATA PRESENTATION AND ANALYSIS

5.1. INTRODUCTION

Chapter 4 dealt with the rationale, applicable research paradigms, research design, and research methodology pertaining to this study. Ethical considerations were also addressed.

In Chapter 5, Part 1, South African education policy documents (White Papers, the Norms and Standards for Educators and the draft policy on Learning Teaching and Support Materials) are investigated, as these papers pertain to e-/m-learning, the FET phase and inclusive education in South Africa. Key points of each document are highlighted for further description and critical analysis. Lastly, recommendations for policy renewal are suggested. Table 13 gives a chronological list of relevant documents selected as research data. The UNESCO Policy guidelines for mobile learning (Kraut 2013) serve as benchmarks for proposing recommendations for South African policy.

Part 2 of Chapter 5 entails the analysis of education systems, structures and management in the USA, Finland and Malawi. Each education system is compared to South Africa and a summative table of all the education systems and structures is presented in Section 5.2.4. Online publications and education legislation of education ministries, agencies and regulatory bodies of each country, were descriptively evaluated and critically compared. I also consulted the websites of national research institutions to obtain additional data and reports for substantiation and to propose best practices for South Africa.

The procedure of investigation and analysis included 1) performing a background study of each country's education system, 2) identifying key characteristics of each education system, 3) performing a critical analysis and 4) comparing the systems to South Africa and each other to make relevant recommendations.

PART 1

Table 13 lists all the relevant South African education policy documents. Currently, there are 7 official white papers that address educational reform and practice in South Africa, but I only discuss White Papers 1,2,4,6 and 7 because they deal with access to education, equitable education provision, the FET phase, inclusive education and ICT's, all of which is relevant to e- and m-learning.

Table 13: South African Education Policy Documents in Chronological Order

Legislation/Policy Document	Year of Publication
White Paper on Education and Training Notice 196	1995
White Paper 2: The organisation, governance and funding of schools	1996
White Paper 4 : Programme for the Transformation of Further Education and Training	1998
Norms and Standards for Educators	2000
White Paper 6: Building an Inclusive Education and Training System	2001
White Paper 7 on e-Education Transforming Learning and Teaching through Information and Communication Technologies (ICTs)	2004
Draft National Policy for the Provision and Management of Learning and Teaching Support Material (LTSM)	2014

5.1.1. EDUCATION WHITE PAPER 1: EDUCATION AND TRAINING (NOTICE 196 OF 1995)

Introduction

White Paper 1 presents a major turning point in South African Education. It was published approximately 1 year after the African National Congress (ANC) came into power. The ideal of this document is phrased as excellence in education for all (DBE 1995:4). It spells out the hierarchy of accountability of officers in the system and describes policy formation but does not deal with detailed implementation. Public responses to the draft white paper was classified and filed for access and consultation (DBE 1995: 8).

The document proposes the development of a National Qualifications Framework (NQF) (DBE 1995: 9). One of the goals of the NQF was to involve both public and private sector education and training providers in setting appropriate national standards and proper accreditation for qualifications (DBE 1995: 11). The formation of the South African Qualifications Authority (SAQA) is also initiated in this white paper.

The Charter of Children's Basic Education Rights

The White Paper suggests the drafting of an Education and Training charter to advance peace and progress in South Africa (DBE 1995: 16). I conducted a search for such a charter but found none. I did retrieve a later charter entitled: *2012 Charter of Children's' Basic Education Rights as presented by the South African Human Rights Commission (SAHRC).* This charter is based on the 4A Framework as developed in 2002 by Katarina Tomaševski from the United Nations (SAHRC 2012: 12). The framework pinpoints the responsibilities (scope and nature) that the State must fulfil to ensure the right to education as guaranteed by international laws.

Framework indicators showed that many learners were still without access to basic learning and teaching materials (textbooks, workbooks and pens/pencils) and that the conditions of school buildings, sanitation facilities and classrooms were inadequate. Some classrooms were not equipped with enough chairs, tables and blackboards. It also mentions high levels of teacher absenteeism and late-coming (SAHRC 2012: 27) resulting in the failure to finish the curriculum on time.

An e-learning system can help address some of these issues by providing education that is available 24/7 online and that adapts faster to the changing needs of society. It can be an effective vehicle to practically implement ideals articulated in this white paper such as: open-access education with good quality opportunities for all, where learners can move from one context to another easily and where educational administration and management systems put the learners first (DBE 1995: 16, 17).

The importance of curriculum choice and appropriate mathematics, science and technology education initiatives to address the chronic national deficit (DBE 1995: 18) is emphasised in white paper 1. If one considers the education statistics stated in Chapter 1, then a backlog in mathematics and science still exists. An e-learning system can help tackle these educational gaps in a cost-effective and efficient manner.

The National Open Learning Agency, National Institute of Curriculum Development and the National Association of Distance Education and Open Learning in South Africa (NADEOSA)

White paper 1 proposes the creation of a National Open Learning Agency and a National Institute of Curriculum Development (DBE 1995: 23, 24). These two organisations were supposedly tasked with implementing the NQF, developing norms and standards for the GET and FET phases and researching and promoting

open learning. My research came back empty when looking for information about these two entities.

I did however come across the website and publications of the National Association of Distance Education and Open Learning in South Africa (NADEOSA). The association's main stated purpose is: "To provide a forum for South African organisations and individuals who are committed to increasing access to an affordable, cost-effective and quality learning environment in which learners are empowered to become self-sufficient members of society". NADEOSA provides networking and information services to facilitate collaboration among different Open Distance Learning (ODL) and distance education providers. Their resources archive contains research abstracts, case study reports and policy documents relating to ODL.

The National Commission on Special Needs in Education and Training (NCSNET) and Current Barriers to Learning and Development

White Paper 1 continues by discussing the importance of Education Support Services (ESS) and the provision of assistance to learners with special educational needs (LSEN) in mainstream schools. The formation of a National Commission on Special Needs in Education and Training (NCSNET) is proposed (DBE 1995: 24, 25).

I retrieved the 1997 report of the NCSNET and the National Committee on Education Support Services (NCESS) entitled: *Quality Education for all: Overcoming Barriers to Learning and Development*. It identifies key barriers to learning observed in South Africa at the time such as: socio-economic barriers, negative and discriminatory attitudes, an inflexible curriculum, language and communication, an inaccessible and unsafe built environment, inappropriate and inadequate provisioning of support services, the lack of enabling and protective legislation and policy, the lack of

parental recognition and involvement, physical disabilities and the lack of human resource development strategies (DBE 1997: 12-16) (many of these issues are mentioned again in White paper 6 on Special Needs Education 2001).

Despite various solutions suggested in the report (DBE 1997: 33-42), these barriers are still present in South Africa. Lack of access to basic services such as transport and medical treatment (DBE 1997: 11), poverty and underdevelopment (DBE 1997: 12), and incidences that place learners at risk such as physical abuse, emotional abuse and substance abuse are regular occurrences in poorer areas. Young girls who fall pregnant are often obligated to drop out of school to provide for their child and criminal violence continues to disrupt learning environments such as the protests experienced last year at Overvaal high school in Gauteng province (de Villiers, Pijoos & Nyoka 2018 and Goba 2018).

The report also mentions that high levels of mobility and migration of families due to urbanisation, the eviction of farm workers and families who seek refugee status also lead to ultimate learning breakdown (DBE 1997: 12). Again a functional online education system can help to provide access to education for these types of people in a more convenient, flexible and safer way. This corresponds to the benefit of mobile learning mentioned in Section 3.7. (Kraut 2013: 9-26), namely, that education disruption can be minimized in conflict areas.

Online Education in Native Languages and an Open Democratic E- Education System

An e-learning system makes it more practicable to provide educational options in more native African languages as the pool of instructors speaking an under-represented (but official) language broadens, and they can be trained to design and add educational materials in their native language to the e-learning database (the content and materials must meet specific minimum educational quality standards

before acceptance). These materials can then be made available to learners nationwide. It can also help promote multilingualism and provide better translation facilities (DBE 1995: 41).

Other aspects of White Paper 1 includes: Adult Basic Education and Training, Early Childhood Development and Higher Education (DBE 1995: 28-31), but for the purposes of this study I do not go into depth with regards to the above mentioned topics or Chapters 7-12 of the white paper.

An effective e-learning framework should adhere to the broad policy principles of access, equity and quality (DBE 1995: 78-80) mentioned in this white paper. It can contribute to establishing a democratic education and training system, which opens the gates of learning and culture to all, and ensures that our nation's human resources potential are developed to the full (DBE 1995: 86).

5.1.2. EDUCATION WHITE PAPER 2: THE ORGANISATION, GOVERNANCE AND FUNDING OF SCHOOLS (NOTICE 130 OF 1996)

Introduction

In accordance with the Education White Paper 2 (DBE 1996: 10) an e-learning framework can "create conditions for developing a coherent, integrated and flexible" e-education system that "advances redress and improves educational quality across the system". It will help to "achieve equitable distribution of education throughout the nation" (DBE 1996:11) by making CAPS aligned curriculum content and assessment tasks available to any student with a mobile device and access to the internet. In this way "all stakeholders" (DBE 1996:11) are empowered when participating in the e-learning system.

School Categories

The Education White Paper 2 (DBE 1996:13-16) categorises schools as: **public schools** (community schools, farm schools, state schools, state-aided schools, church schools, technical schools, Model C schools and mine schools) and **independent schools** (private schools, home schools, education trusts, Section 21 companies not for gain, Close Corporations and Proprietary owned).

An e-learning framework for South Africa and Africa should not differentiate between the different types of schools on the grounds of their governance and management structures (DBE 1996: 16-28), financing (DBE 1996: 29-38) or ownership (DBE 1996: 43). Thus it serves as a national, overarching e-learning framework for all provinces and schools accessible by any learner or educator in Africa.

5.1.3. EDUCATION WHITE PAPER 4: A PROGRAMME FOR THE TRANSFORMATION OF FURTHER EDUCATION AND TRAINING (NOTICE 2188 OF 1998)

Introduction

The FET White Paper 4 of August 1998 is aptly entitled: Preparing for the Twenty-First Century through education, training and work (DBE 1998: 3). It reveals the deficiencies in South Africa's education system at the time and offers to correct inadequacies. One intention is of significance: "...we will develop a range of initiatives to encourage greater innovation and responsiveness in the school sector." (DBE 1998: 24)

This document presents a programme for the transformation of Further Education and Training. Amongst others, it addresses contribution to Human Resource Development (HRD) and E-learning concerning Labour Market needs.

Human Resource Development and Vocationalisation

"Vocationalisation" (DBE 1998: 52) is put forward "to enhance" (DBE 1998: 17) individual employability, reduce mismatch between demand and supply of skilled workers and provides an alternative for those pursuing higher education. Furthermore, vocationalisation is an attempt to reduce the significance and amount of academic or theoretical knowledge because occupational skills training are increased. This supports the outcomes-based education rationale practically.

A long term goal which holds opportunity is 5.3 "Our open learning philosophy and programmed-based approach to provision will encourage institutional diversity, the use of multiple sites of learning, and growth of 'virtual' institutions," (DBE 1998: 36).

Although high quality assurance is given, practice has proven otherwise. An e-learning framework provides a vehicle towards quality assurance because standardization of content level is put on par with international parameters. The framework becomes HRD which is both on hand and in hand. It enables a more current and streamlined connection between e-learning and the labour market because it structures creative content. Thus the framework forms part of the growth of virtual institutions and can support on track development in South African education to become more competitive internationally.

I conducted a search for progress made in transforming Further Education and Training since 1998 and retrieved Asmal's (2001) report entitled: *Education in SA: Achievements since 1994* which was published to prioritise "school effectiveness and teacher professionalism, the fight against illiteracy, further education and training and higher education and the organisational effectiveness of national and provincial

systems" (DBE 2001: 12). Asmal also comments on the dysfunctionality in the national HRD and FET (DBE 2001: 41). An e-learning framework can help enhance e-education organisational effectiveness nationally.

The GET Curriculum of 2005 shows a progressive outcomes-based approach in learner-centered education. But as stated above, efforts in practice did not reach the bar expressed or intended.

Simkins (2017), of the Helen Suzman Foundation, reports on the DBE's new three stream policy of education that introduces a technical occupation stream to offer vocational programmes with 22 specialisations (including agriculture, early childhood development, motor mechanics, welding, maintenance, food production, hospitality, wholesale and retail, bricklaying and plastering, plumbing and security services). According to Simkins (2017), the success of the German vocational educational system has encouraged South Africa to improve our system as well. Over the years there have been constant complaints from South African business that education graduates are not ready for the world of work and there is a chronic short-supply of skilled manual labourers. This new three-stream policy is expected to reduce the current influx burden on South African universities (BusinessTech 2018) as well. E-learning and m-learning can fulfil a supportive role in making video tutorials and educational content available to learners in the technical occupational phase.

5.1.4. NORMS AND STANDARDS FOR EDUCATORS 2000 (GOVERNMENT NOTICE 82)

Introduction

The Norms and Standards for Educators is an attempt to establish a set of 'best practice' procedures for educators. It prescribes seven traditional roles that an educator must fulfil with practical, foundational and reflexive competencies

accompanying each role (DBE 2000: 13-14). Sibaya & Sibaya (2008: 86) report that novice educators (who have taught for 18 to 24 months after completing their teacher education) experienced that the teacher education programme, as proposed by the Norms and Standards for Educators, is inadequate and did not prepare prospective educators to teach effectively (Sibaya & Sibaya 2008: 94).

Problems in Practice

According to Sibaya & Sibaya (2008: 98, 99) the number of components and educator roles is too fragmented and does not define the end product of the training. These roles require separate, individual, specialised jobs in education practice. One does not see a counsellor or psychologist acting as an administrator and assessor of learning at the same time. But it is expected of educators to fulfil all these duties simultaneously. By expecting a single individual to act as mediator, pastor, assessor, administrator, researcher and learning programme developer one only creates overwhelm, confusion, chaos, burn-out and mediocre teaching. Upon reading the Norms and Standards, I could not find any practical instruction and real-life guidance for challenging situations that occur in teaching practice. Sibaya & Sibaya (2008:94, 95) propose that the number of roles should be reduced and teacher education should be career-focussed as a profession as educators are vulnerable to public scrutiny and public sanction if their performance does not meet public expectation.

How E-learning Can Facilitate Educators' Professional Development

An online system can empower educators to continue their professional development (DBE 2000: 19) by presenting 'refresher' and other professional development courses to educators online. Via online, opportunities are created for educators to reflect on the relationships between subjects/disciplines (DBE 2000: 22) so that they can be integrated more effectively and that lessons can be designed to

better meet the needs of the learners by selecting, sequencing and pacing (DBE 2000: 21) learning content.

In an e-learning environment the educator is removed from direct conflict with learners and disciplinary fall-outs. As a result educators will be able to better direct their focus and energies to adapt learning programmes and design impactful lessons that meet desired outcomes (DBE 2000: 16) as emotional and circumstantial problems are not present in an e-learning environment. An online system can alleviate the administrative burden of educators because the collection and analysis, monitoring, tracking and feedback function of learner progress and data can be automated. A central database can hold and archive all learning materials, student information, assessment submissions and performance results.

To illustrate a practical example: Instead of the onus lying on a single teacher to be able to instruct effectively in the learner's first language and use a second official language to explain key concepts, including sign language (DBE 2000: 15), three educators can be employed. One educator will conduct the lesson in the first language of the learner while the other educators will present the same lesson in a second language and sign language. All three lessons will be accessible to the learner online via his/her mobile device if needed.

5.1.5. EDUCATION WHITE PAPER 6 SPECIAL NEEDS EDUCATION BUILDING AN INCLUSIVE EDUCATION AND TRAINING SYSTEM JULY 2001

Introduction

White Paper 6 on Special Needs Education was released in July 2001 as a response from the South African government's Ministry of Education to the inclusion movement (van Rooyen, Newmark & le Grange 2003).

According to White Paper 6 an Inclusive Education and Training System should provide educational opportunities to those learners who have experienced barriers to learning (DBE 2001: 6). An e-learning system can achieve this by maximising learner participation and uncovering learning barriers through collection, tracking and analysis of learner data and progress. The "*frequency and quality of monitoring and support services provided to schools*" can also be improved via an e-education system as per goal 27 of the DBE's *2019 Action Plan: Toward Schooling 2030* (DBE 2015: 3).

White Paper 6 gives many reasons for learning needs arising such as: "an inflexible curriculum, inappropriate languages or language of learning and teaching, inappropriate communication, inaccessible and unsafe built environments, inadequate support services, inadequate policies and legislation, non-recognition and non-involvement of parents and inadequately trained education managers and educators" (DBE 2001: 7, 18). These aspects can be improved by implementing a national e-learning strategy and system.

Flexible Curriculum, Effective Communication and Parental Involvement

A flexible curriculum is more possible via online than in a traditional classroom setting. Inappropriate communication and language of teaching and learning can be reduced by recording lessons in the learner's native language. Optimal communication is ensured when instructions and feedback are simplistic, personalised and timely. Eventually an educational database with educational materials in all the official languages can be created and maintained. Automatic and periodic notifications can be sent to parents on learner activity and progress. This will promote parental involvement and improve parental awareness of their child's development. A communication channel for parents to ask questions and make comments/suggestions can also be created. This functionality corresponds with goal 22 of the DBE's *Action Plan to 2019: Towards the Realisation of Schooling 2030* namely: to "improve parent and community participation in the governance of

schools, partly by improving access to important information via the e-Education strategy" (DBE 2015: 3).

Inclusivity versus Mainstreaming

White paper 6 lays out an extensive explanation of Inclusive Education and Training. I highlight only the most relevant factors applicable to this study:

An inclusive education system accommodates learner needs by adapting teaching methodologies and changing curricula to meet the needs of all learners (DBE 2001: 16). It empowers learners to advance their individual strengths and talents and it accepts and respects learner differences (DBE 2001: 16).

Mainstreaming per this white paper is "getting learners to fit into" or become "integrated into" an existing system whereas inclusion means "overcoming barriers in the system" so that all learners can be supported and their different needs met (DBE 2001: 17). An e-learning system is inclusive. By making quality educative materials more accessible and open to all learners it can help reduce barriers in the current system.

A Renewed and Relevant Online Curriculum

White Paper 6 (DBE 2001: 19) presents a list of points that a curriculum must address in order to remove barriers to learning which also applies to e- and m-curriculum. Each aspect, with a short practical explanation follows below.

- **Content** - should be current (not outdated) and relevant, it can be presented as micro-learning units to keep learners interested and engaged.

- **Language and Medium of Instruction** – at this stage English, but preferably the learners' native language

- **The organisation and management of the lesson/class** – this includes total lecture time, learner development level, number of learners enrolled etc.

- **Teaching methods and processes used** – video/audio lessons, resources as pdf documents/files with visual illustrations and gamified multiple choice practice questions

- **The pace of teaching and time frame for completing the curriculum**– lessons should not be too long or too fast

- **The learning materials needed and how assessment will take place** – the learner needs only his/her mobile device with internet access. Assessment will initially take place in the form of practice gamified and drill (MCQ) exercises to promote long-term memory retention and subject mastery

An e-learning framework and system can expand institutional capacity (DBE 2001: 46) as more students can be reached virtually. As previously mentioned, learning difficulties (DBE 2001: 49) can be identified through automatic and continuous monitoring of student progress and data.

E-learning and M-learning can simplify and speed up education delivery considerably. The long term goal of creating an open, lifelong and high-quality education and training system for the 21st century (DBE 2001: 45) is an apt description of what my proposed e-learning framework aims to achieve.

5.1.7. WHITE PAPER 7 WHITE PAPER ON E-EDUCATION (NOTICE 1922 OF 2004)

Introduction

White Paper 7 gives the DBE's response to a new information and communication technology (ICT) environment with the ideal to ensure that every school has access to diverse, high-quality communication services that benefit all learners and local communities (DBE 2004: 6). Fiscal constraints, spatial barriers and capacity-related limitations have impaired South Africa in overcoming connectivity challenges and infrastructure disparities. There is also a noticeable lack in quality and local language content of local websites (DBE 2004: 9). People from impoverished communities and the elderly exhibit cultural inhibitions and insecurities when using digital devices. They struggle to adapt to the digital fast pace.

According to this white paper insufficient effort has been made to create an open investment climate for the creation, growth and initial public offering phases of ICT-related SMMEs (Small to Medium Managed Enterprises) (DBE 2004: 9).

An e-learning system can provide a platform for creating virtual learning hubs. Anywhere a learner is present with a mobile device and internet access becomes a potential learning hub. Optimal availability, better access to quality education and bridging the digital divide, thus becomes possible (DBE 2004: 8-9). I agree that e-education can be implemented to reorganise schooling and aid whole-school development (DBE 2004: 14). E -learning can enhance the quality and reach of instructors' teaching (DBE 2004: 19).

Skills-Based Teaching, Learner Autonomy, Learning Networks and a National E-learning Portal with Access to Public Resources

Asmal (DBE 2001: 41) states that the labour market currently places no value on the learning achievements of students before they exit matric. Although the South African schools Act no. 84 of 1996 Section 3(1) permits students to leave school after grade 9 (or 15 years of age), there are still very few job opportunities or skilled in-service training options for these learners. I agree that students should be equipped with the current skills needed to enhance employability (DBE 2004: 14). An e-learning system can make short skills-related courses (like plumbing, technical assistance, cell phone and computer repairs, programming, learning a language, bookkeeping, using a specific software application, report writing, technology installations and small scale farming) or entrepreneurial courses available to students. They can then use these skills in their occupations while they are still learning or alternatively they can create their own businesses to support themselves.

An e-learning system would enable networks of support (DBE 2004: 16) among teachers and learners so that collective learning (DBE 2004: 16) can be facilitated. Learner-centred, active, exploratory and inquiry-based learning can be promoted through properly structured learning materials and projects/assessment tasks (DBE 2004: 19). E-learning affords a learner access to more diverse resources beyond what limited school libraries are providing (DBE 2004: 19). Currently, school libraries are unable to support resource-based learning. A suggested solution to this problem is to make resources from public libraries, museums and government offices available online (DBE 2004:28). A national e-learning database accessible via an e-learning platform (or education portal), can enable educators and learners throughout the country to access pictures with descriptions and explanations of artefacts and short video documentaries about historic events, world geography, nature and climate and latest science discoveries online through their mobile devices. Learners and teachers could also participate in virtual museum expeditions and virtual tours of national buildings, heritage sites and natural wonders. Such a portal and national database would require the digitization, uploading and systematic

cataloguing of all public resources onto a protected online server facility that is accessible via the e-learning portal.

White paper 7 stipulates norms and standards relevant to educational ICTs (DBE 2004: 23, 24) that pertain to educational content and delivery, rights management and safety and security. I address these below:

Norms and Standards for ICT's (Educational Content, Rights Management and Safety and Security)

A. Educational Content and Delivery

1) **Educational soundness of content** stipulates that e-learning materials must be compatible with and accessible on different types of existing hardware and software. The e-learning platform should be fully functional and accessible from any device with Android, IOS, Linux and Windows operating systems. Learning content must be available to both ordinary learners and those experiencing barriers to learning. It should add value to teaching and learning tasks (DBE 2004: 23).

2) **Inter-operability of content** includes the concepts of durability, scalability and flexibility (DBE 2004: 24). Changes in technology should be able to occur without needing to redesign or recode the learning content (DBE 2004: 23). The e-learning system must be able to run without any technical errors while content is simultaneously distributed and used by large numbers of learners in broad locations.

3) **Flexibility** stipulates that future changes in technology must be anticipated, multiple platforms incorporated and various software options evaluated to employ an appropriate mix of technologies (DBE 2004: 23).

B. Rights Management and Safety and Security

In order to set up a successful e-learning/m-learning system, one must consider rights management norms such as intellectual property licensing, branding, flexible rights trading and compliance (DBE 2004: 24). Network and information security (DBE 2004: 23) are also important for establishing safety and control measures (such as digital watermarking, described in Chapter 2). White Paper 7 states that the Department of Education is responsible for establishing standards and guidelines for the use of networks and rights management (DBE 2004: 32). However, no such documents have yet been drafted or made available for public comment.

Legislated e-Rate

White paper 7 proposes the application of a legislated e-rate implemented by government to ensure that the cost of basic connectivity is affordable (DBE 2004: 32). This is crucial, because learners cannot be expected to pay high amounts for internet connectivity/broadband. It would completely defeat the purpose of free/affordable access to education.

Reality shows that the goal of White Paper 7: "for every learner in the GET and FET bands to be ICT capable by 2013" (DBE 2004: 38) has not been realised. Gauteng was the only province in the country that attempted an ICT roll-out and e-learning initiative among Sowetan township schools as discussed below.

The Paperless Classroom Project and Online Registrations

News reports appeared in 2015 identifying schools in Soweto, Gauteng that received ICT infrastructure under The Paperless Classroom Project of 2015. This five year programme targets no-fee schools in townships (Motau 2017, Motau 2017). It

serviced 377 schools with ICT infrastructure. A total of 1 800 Grade 12 classrooms were refurbished with smart boards, 3 393 Grade 12 educators were trained in ICT and received laptops and 64 000 Grade 12 learners received tablets with e-learning content and connectivity (ICT roll out 2016). Many difficulties became apparent however. Mashaba (2016) and Gedye (2016) report on the challenges (financial costs of repairs, theft, untrained teachers and learner negligence) evident during implementation. In principle this is a great initiative and in line with international educational standards and developments, but there are still many obstacles to overcome before the whole country will be able to benefit from such a project. A national e-learning framework and system with pre-recorded content can better address these shortcomings. If the learner can use his/her own device to access materials (instead of sponsoring a device for each learner) you could reduce breakage costs due to the irresponsible behaviour of learners and theft. Schools in other provinces of the country do not yet benefit from the Paperless Classroom Project. A national e-learning framework and system for mobile devices can help to equalize the playing field.

A different digital initiative undertaken by the Gauteng Department of Education was to administer online school registrations with SMS notification for learners in grade 1 and 8 for the 2017 academic year. More than 220 000 learners made use of the facility (Mzekandaba 2016). This shows that people are open to online, mobile alternatives, and that m-learning has the potential to grow in South Africa.

The DBE has published a draft policy document pertaining to the creation, administration and delivery of e- and m-learning instructional content. I briefly discuss this document in the following section.

5.1.8. DRAFT NATIONAL POLICY FOR THE PROVISION AND MANAGEMENT OF LEARNING AND TEACHING SUPPORT MATERIAL (LTSM) 2014

Introduction

An e-learning framework is a development and production of LTSM as it ensures the on-going creation of standardized, quality e-learning materials. It encompasses e-LTSM, but it guides a broader scope of e-learning material creation as it includes online pre-recorded and interactive lessons and lectures, games and assessment tasks. Student engagement with content is both auditory and visual, not only reading.

Guiding Principles of LTSM

I identified four applicable key guiding principles of LTSM policy:

The aim of ***resource provision*** reinforces the idea that respect for diversity and democracy will be engendered. My e-learning framework respects multi-cultural perspectives and educative content created in accordance with its guidelines will be "current", "age appropriate" and "relevant" (DBE 2014: 8).

Independent learning implies *accountability* from all participants involved in the creation and use of e-learning content. My e-learning framework is designed to promote *independent learning* and it is pro ***learner support*** as it provides instantaneous feedback on completed tasks. Online discussions between learners, instructors and learner peers are part of the parcel.

It reduces the administrative and managerial burden of LTSM procurement, distribution (DBE 2014: 17-21), safe-keeping, retention and retrieval (DBE 2014: 22-25) as all materials are stored and accessed online. This will have cost benefits as consequence.

5.1.9. ENABLING MOBILE LEARNING THROUGH EDUCATION POLICY

There is evident absence of policies dedicated to mobile learning among African countries. This is mostly due to the ignorance of policy makers regarding mobile capabilities, negative perceptions and preconceived notions about mobile learning, limited examples of sustainable and scalable projects and uncertainty about issues related to digital access rights, censorship and privacy concerns (Kraut 2013). The DBE of South African is aware of some of the potential benefits that mobile education can offer, but as yet no dedicated policy on mobile learning exists (Aluko 2017: 30). This policy should guide the distribution, implementation and use, administration, management and monitoring of mobile technologies for education purposes (Aluko 2017: 24-26).

UNESCO (Kraut 2013: 29-39) has provided policy guidelines which local governments can apply within their specific contexts. I briefly discuss each of the 10 guidelines below:

I.   Create or update policies related to mobile learning

Many of South Africa's education policy documents (such as white papers 1, 2, 4 and 6) were articulated in a 'pre mobile' era and therefore they do not seek to maximise the learning potential of mobile technology (Kraut 2013: 29). White paper 7 was released when only 6.4% of the South African population had access to the internet (DBE 2004: 8) and the draft policy on Learning Teaching and Support Materials still hasn't been officially approved. Although these policies share noble principles, they do not give specific guidance with actionable steps, appropriate timelines or measurable indicators to track progress for the achievement of specific educational goals. There is thus impetus for the removal and revision of old policies that have become redundant and for creating new policy specifically focussed on mobile learning and teaching.

UNESCO (Kraut 2013: 29) recommends that blanket prohibitions, such as universal bans (unless implemented for well-considered reasons) of mobile devices should be avoided when drafting policy, and guidance must be given on how new investments in technology can work in conjunction with existing educational initiatives.

II. Train teachers to advance learning through mobile technologies

UNESCO's research has shown that without guidance and instruction teachers will use technology to 'do old things in new ways' instead of transforming and improving approaches to teaching and learning (Kraut 2013: 30). Technology and devices develop rapidly and as they become more versatile and complex, they also become more daunting to use. Thus it is imperative to prioritize the professional development of teachers and provide them with the required technical and pedagogical training to maximise the educational advantages of mobile devices. Teacher training institutes should incorporate mobile learning into their programmes and curricula.

III. Provide support and training to teachers

It can be cost-effective and practical to assist educators via mobile technologies. Curriculum, educational resources and lesson plans should be made available to teachers remotely (online/via mobile) (Kraut 2013: 31). Professional development of teachers through mobile means can complement, but need not replace face-to-face training.

IV.   Create and optimize educational content

Current challenges relating to educational content include:

- Large amounts of content are not compatible with or accessible from mobile devices.
- Content often lacks relevance to local student populations due to limited language options or little cultural relevance.
- A lot of content does not follow standards or incorporate features to improve accessibility for disabled students

Kraut (2013: 32) recommends that open licensing of mobile content and use of open educational resources (OER) should be supported to facilitate it widest use and adaptation. Content developers should be incentivised to build and create content specifically for mobile devices. Designers will need to 'think mobile first' so that content can be streamlined for viewing and presenting on small screens with limited input options. Platforms and software that enable educators to create or tailor mobile content must be developed. Local language content creation should be promoted and standards must be established to make hardware, software and educational content accessible to diverse student populations including those with disabilities.

V.   Ensure gender equality

According to Kraut (2013: 33), more men in middle-income countries own mobile phones than women. Men are also more likely to know how to use mobile technology than women. The mobile gender gap is a symptom of broader gender inequalities. Policy-makers must endeavour to improve existing ICT-education gender gaps and develop strategies to teach women and girls as well as men and boys technological skills.

VI. Expand and improve connectivity options while ensuing equity

Governments must work with relevant industries to build and augment the technological infrastructure that powers mobile learning (Kraut 2013: 34). Governments must seek to provide equal access to mobile connectivity. For this to happen, stock must be taken of existing ICT infrastructure and realistic targets must be set to incrementally improve infrastructure. Robust and affordable mobile networks must be supported especially in educational institutions and libraries. Full or partial subsidies can be provided for access to mobile data and broadband services (such as the legislated e-rate proposed in white paper 7). Kraut (2013: 33) recommends that governments should now consider advocating for 'm-rate' subsidies to promote mobile access to the internet.

VII. Develop strategies to provide equal access for all

There are 3 widely practiced models for ensuring people have the necessary hardware for mobile learning:

a) Governments/institutions provide devices directly to learners (like the paperless classroom project in Gauteng province)
b) Learners supply their own devices (BYOD – bring your own device)
c) Governments and institutions share provisioning responsibilities with learners

The BYOD model is inexpensive because the acquisition, maintenance and connectivity costs are carried by the learner, but it can be limiting if scenarios are created where learners with newer and superior devices outperform those with inferior devices and slower/weaker connection plans. Government departments and educational institutions should negotiate with vendors to leverage the purchasing power of large numbers of learners.

VIII.   Promote safe, responsible and healthy use of mobile technologies

Digital citizenship should be taught to promote responsible use of mobile devices. Responsible Use Policies (RUPs) can help indicate and reinforce healthy mobile habits while ensuring that educators are not forced to police mobile technology use. South Africa does not yet have any policies in place that deal with ethical mobile technology usage. Strategies that balance online and offline interaction must be articulated and communicated to inform the public about what is productive and unproductive, healthy and unhealthy screen time. Governments and policy-makers must stay abreast of latest research regarding the health risks associated with mobile technology use such as eye strain and exposure to electromagnetic radiation.

IX.   Use mobile technologies to improve communication and education management

Mobile technologies can streamline administrative tasks such as recording attendance (see myattendancetracker.com and Attendance Tracker) and assessment results or grading (20 Time-Saving Grading Apps, Renard 2016) allowing educators more time to focus on instruction. Mobile technologies can also improve communication between schools, teachers, students and parents and it can facilitate data gathering to improve education management. Policies should consider how mobile technologies can support the collection of educational information following a conflict or disaster.

X.   Raise awareness of mobile learning through advocacy, leadership and dialogue

Research findings and evaluations of mobile learning programmes should be shared. Dialogue among key stakeholders about mobile learning must be

encouraged and a coherent vision must be presented of how mobile technologies will further learning goals.

The UNESCO mobile policy guidelines serve as benchmarks against which South African education policy is evaluated. South Africa does not have any education policy governing mobile education and all current education policy documents were issued in a pre-digital, pre-mobile era. Kraut (2013) concisely pinpoints crucial aspects that must be considered when developing mobile education policy. Overall, I found the UNESCO guidelines to be less repetitive, phrased more aptly and easier to follow than the DBE's white papers.

5.1.10. CONCLUSION TO PART 1

When considering South African education policy juxtaposed to UNESCO's mobile policy guidelines, it is clear that outdated and redundant policies, issued before the digital era, should be removed or replaced. These white papers are excessively long and repetitive with grammatical errors making for tedious and frustrating reading. Despite the high volumes of policy and action plans published, quality education and e-/m-learning provision remains lacking in South Africa. There is potential to develop and implement e- and m-learning on national scale and a framework can help to achieve this goal.

In the following section I explore the education systems, legislation and e-learning initiatives of the USA, Finland and Malawi. By comparing education systems, governance and e-education progress, recommendations can be made for South Africa and the African continent as a whole. The US education system is discussed first.

PART 2

5.2.1. EDUCATION IN THE USA

The US Department of Education

According to the U.S. Department of Education's (ED) website (https://www.ed.gov/), its main functions are to establish policy on federal financial aid for education and to distribute and monitor those funds. ED is also responsible for collecting data on US schools and distributing research. Unlike the South African education system, the US education system is decentralised and the Department of Education is relatively uninvolved with selecting and establishing curricula or educational standards .These are the responsibilities of the individual education departments of each separate state in the US (Wikipedia 2018d).

ED does not have any direct public jurisdictional control over the accreditation process of degrees and certifications offered by educational institutions, neither is it involved in establishing schools and colleges (Wikipedia 2018d, ED 2018). It does work with federal partners of the US Interagency Council on Homelessness to provide education for the homeless (Wikipedia 2018d, ED 2018).

For a country's education department and education system to function optimally, citizens' tax contributions are invested into education development and learning initiatives. Key US education budget provisions are compared to that of South Africa in the next section.

US Education Budget for 2019

The 2019 Budget of the U.S. Government (Budget 2019: 39-44) maintains that quality education prevails when parents have the freedom and right to choose a K-12 school for their child and when learners are provided with the necessary tools to succeed.

Some of the educational investments of the Budget include:

1) **High-quality special education services to** in excess of 6.8 million **children with disabilities**. It adheres to the formula stipulated in the Individuals with Disabilities Education Act (IDEA 2019) (TIE 2016, Carmack 2012) and provides discretionary grants to States, higher education institutions and non-profit organisations.

2) **Funds for School Climate Transformation** initiatives at schools to help **prevent opioid abuse** amongst learners. Opioid addiction has escalated into a national crisis in the US (Bloomberg 2018, Wall Street Journal 2017).

3) **Grants to promote innovation and reform in Science Technology Engineering and Mathematics (STEM) Education**

4) The **Pell Grant program for short-term certification/licensing programs** in an in-demand field and career and technical education (CTE) training programs.

South Africa's National Budget (National Treasury 2018 : iii-v, 57- 59) gives a break-down of funds made available for education in the country. It is positive to note that South Africa has been ranked first on the 2017 Open Budget Index, tied with New Zealand. This index evaluates the comprehensiveness and timely availability of a country's budget documentation (National Treasury 2018: 12). South Africa achieved 89% in terms of transparency, which shows that effort is being made from

government to communicate financial decisions openly with the public. This serves a very important educative purpose for the nation's citizens as it facilitates South Africans' financial understanding and promotes public participation in national budget processes (National Treasury 2018: 12) which is how a successful and fair democracy should function.

The South African national budget for learning and culture is estimated at R 323 075 million. Seventy percent of this budget (R 231 638 million) is allocated to Basic Education of which 77% goes toward compensating employees in provincial education departments. This, in my opinion, is very high and neglects FET learners in poverty stricken areas and communities. The United Nations International Children's Emergency Fund's (UNICEF 2017) brief of South Africa's 2017/2018 Education Budget recommends that government should reform the provincial education allocation formula to better consider learners in poverty and to investigate whether the present per-pupil allocation of funds is adequate to improve the quality of education (UNICEF 2017: 2). E- and m-learning makes quality instruction accessible at reduced costs per learner.

Remaining budget funds available for learning and culture are split between school infrastructure grants, curriculum delivery (workbooks, textbooks, teacher support and access to ICTs) and the national school nutrition programme that feeds approximately 9 million learners every day (National Treasury 2018: 58).

The literature indicates that a very small portion of South Africa's education budget actually goes towards FET phase curriculum and instructional development. After deducting provincial education department employees' salaries most of the money left over flows into physical school infrastructure grants (of which there is currently a backlog outstanding) and the national nutrition programme. Thereafter, emphasis is placed on the ECD phase and not the FET phase. No specific allocations are made for science, technology engineering and mathematics (STEM) education in schools either. An e-learning system accessible via mobile with low-cost, quality educational

content targeting STEM subjects can thus fulfil an important role to make these subjects more affordable and accessible to previously disadvantaged students.

Besides, allocating and administering funds towards a country's education system, a government also enacts and enforces education legislation and policy to administrate and manage the system, education processes and the many diverse stakeholders involved.

Most of the education policies in the USA are established at state and local levels. Education legislation (ED 2017) in the USA includes: the Every Student Succeeds Act (ESSA), the Family Educational Rights and Privacy Act (FERPA) and the Individuals with Disabilities Act (IDEA). For the purposes of this study, I only investigate ESSA in more depth.

The Every Student Succeeds Act (ESSA)

The Every Student Succeeds Act governs public education policy for K-12 schools and was signed into law on 10 December 2015, to replace the No Child Left Behind Act (Klein 2015). ESSA shifts the federal power for school decision making back to states and local districts.

States must administer annual standardised tests and report the results (Klein 2016). States are also responsible for setting their own academic standards and must submit their goals, standards and plans of action to the Education Department (Klein 2016). According to Klein (2016) the following are key elements of ESSA:

1) **Accountability Plans** to be submitted to the Education Department.

2) **Accountability Goals** where states can pick their own goals (long-term, interim and short term). These goals should include proficiency in tests, English language proficiency and graduation rates. Goals must aim to close achievement gaps.

3) Elementary, Middle and High schools need to have **Accountability Systems** with **academic indicators** (such as proficiency on state tests and English-language proficiency). At least **one different additional indicator** must be included (such as student engagement, educator engagement, access to and advanced coursework, postsecondary readiness, school climate/safety). **Participation rates** on state tests have to be factored in and high schools are obligated to include **graduation rates**.

4) States are obligated to **intervene in the bottom 5 percent of schools** (low performers where graduation rates are below 67%). These schools have to be identified at least once every 3 years. Intervention stipulations are explained by Klein (2016).

5) Students have to **be tested in reading and math from grade 3 to 8 and once in high school**. The federal participation requirement in tests is 95%. Districts may use local, nationally recognized tests at high school level such as the SAT (Suite of Assessments) or ACT (American College Testing). Up to seven states may apply for permission from ED to attempt local tests for a limited time. States can also create their own testing opt-out laws and decide how to address schools that do not meet targets.

6) States must adopt **"challenging" academic standards**, which could be Common Core State Standards, but it does not need to be. The US Secretary of Education may not prescribe any particular set of standards to states.

7) **Accountability for English-Language Learners (ELL)** is given priority in Title 1. In their first year of schooling new ELLs results will not count toward a school's rating, but in years 2 and 3 their results must be incorporated.

8) **Only 1% of students overall can be provided with alternative tests** (10% of students in special education).

9) A **block grant of $1.6 billion** is provided to consolidate dozens of educational programs (physical education, advanced placement, school counselling and education technology). Districts that receive more than $30 000 must use at least 20% of their funding on activities that help students become well-rounded and another 20% on at least one activity that helps students be safe and healthy.

10) **Teacher evaluations through student outcomes and the requirement for a "highly qualified teacher" have been done away with**. The Teacher and School Leader Innovation Program makes grants available to districts that want to try out performance pay and other teacher-quality improvement measures.

11) States are expected to keep their spending at a particular level in order to tap federal funds.

ESSA provides more flexibility on testing, ending the "adequate yearly progress" measure, where schools had to calculate and show test score gains and it provides an arts education fund (Battenfield 2015). It also promotes a "well-rounded education" where subjects like social studies and arts have equal standing with others and it stops the practice of putting multiple student subgroups into "super groups" to hide inequities.

Criticisms of ESSA (Battenfield 2015) are that it still prescribes standardised testing to monitor academic performance of vulnerable groups and that States only have to intervene in the bottom 5% of low performing schools, not in the other schools. In effect many vulnerable and low performing schools suffer and achievement gaps do not necessarily improve. Figlio (2003) explains that accountability systems have many incentives embedded within them to 'game the system' and that the successful design of accountability systems depends on identifying and closing as many of the loopholes as possible. Schools could however still find other ways to inflate their

observed performance and thus aggregate test scores must not be viewed as perfect indicators of school productivity.

Principal Distribution and Turnover & Teacher Management and Teaching Quality

Fuller, Hollingworth and Pendola (2017) investigated how effectively US state equity plans identify school principal distributions and principal turnover, to establish the extent to which hiring of teachers, the development of their instructional capacity and teacher turnover management is affected. The study tried to ascertain how access to effective educators is influenced by school leadership. According to Pendola and Fuller (2017) the inequitable distribution of principals has a multiplicative and reinforcing effect on the inequitable distribution of teachers. Lower quality principals tend to hire lower quality teachers (Baker & Cooper 2005). And greater turnover of principals cause greater teacher turnover (Pendola & Fuller 2017). Amrein-Beardsley (2012: 3) highlights social isolation due to the geographical seclusion of rural areas as another reason for teachers leaving the profession.

Wills (2015) profiled the labour market for school principals in South Africa. She shows that principals are unequally distributed across schools in SA as well, with less qualified and less experienced principals overly represented in poorer schools. The age profile of school principals in South Africa is also rising (Wills 2015: 10).

Via mobile the best teachers in South Africa can teach remotely and on a part-time basis. A school principal is not a crucial requirement for the optimal functioning of an e-learning system, neither would teachers be obligated to relocate and live in rural, secluded areas. In order to guide lesson structure, time and quality, lesson templates with curriculum content must be developed for and presented to the instructor to follow online when designing and presenting his/her lesson. All lessons would have

to go through a review process before being made available on the e-learning/m-learning system.

US Common Core State Standards Initiative

The US Common Core State Standards (http://www.corestandards.org/) are the college and career-ready educational standards (learning goals) for students from kindergarten up to Grade 12 in English language Arts/Literacy and Mathematics. State education chiefs and governors of 48 US states developed the Common Core and currently there are 41 states that have voluntarily adopted the standards. The Common Core Frequently Asked Questions webpage (FAQ 2018) gives an overview on the development process, purpose and implementation of the standards as well as content and quality stipulations of the standards. Specific standards for each grade can be found on the common core website (CC 2018). This 3 minute video (https://vimeo.com/116379560) provides a further overview of the Common Core Standards.

Betsy DeVos, the current secretary of US education, remarked that the US Common Core is dead (Scanlon 2018). She advocates that another 'top-down' federal government policy is not the answer, but rather a paradigm shift and fundamental reorientation or 'rethink' of education (Downey 2018, DeVos 2018) to promote school choice and the freedom to learn. According to DeVos, aspects such as grouping students by age, closing schools for the summer, starting the school days later and allowing learners to learn at their own pace are all factors to be considered.

The Institute of Education Sciences

The U.S. Department of Education has an independent, non-partisan research and evaluation institute called the Institute of Education Sciences (IES). It originated under the Education Sciences Reform Act of 2002 with the purpose to provide

scientific evidence to inform education policy and practice and to share information in accessible formats with all public stakeholders (Wikipedia 2018c). The IES has 6 main functions:

1) Providing **statistical data** on US education by conducting both **national and international assessments**.

2) Conducting **nationally representative surveys** and **funding research** for improving education

3) Funding research on **new approaches to improve academic outcomes** (pilot studies on instruction, student behaviour, teacher training, technology and/or school and system governance).

4) Conducting independent, non-partisan **large scale evaluations of federally funded education programs and policies** such as alternative pathways to education, education evaluation systems, school improvement initiatives and school choice programs

5) Advancing the use of data in educational research via the **What Works Clearing House, Regional Education Laboratories and State Wide Longitudinal Data System Grants** to help states track education outcomes more efficiently and provide useful , timely information to stakeholders

6) Advancing specialised training in statistics methods and measures through pre- and post-doctoral programs, database training and short course.

According to its website (https://ies.ed.gov/); the IES consists of four main research and statistics centers. I elaborate on each as follows:

I. *The National Center for Education Evaluation and Regional Assistance (NCEE)*

The NCEE conducts evaluations of federal programs, synthesizes and distributes information from these evaluations and research to provide technical assistance to improve student achievement. The NCEE (2017: 2) consists of the following bodies:

a) A Regional Educational Laboratory Program (REL)
b) What Works Clearinghouse (WWC)
c) Education Resources Information Center (ERIC)
d) National Library of Education (NLE)

II. *The National Center for Education Research (NCER)*

According its webpage (https://ies.ed.gov/ncer/), the NCER supports research to improve learner outcomes and education quality in the United States and finds workable solutions to educational challenges. The NCER also supports training programs to prepare researchers to conduct high quality, scientific education research.

III. *The National Center for Education Statistics (NCES)*

Introduction

The NCES is the primary federal entity that collects, analyses and releases published reports on education statistics and public school district finance information in the USA. It performs international comparisons of education statistics and is a pioneer in the development and use of standardised terminology. Among the programs and initiatives that NCES oversees is the National Assessment of Educational Progress which has been administered since 1969 (NAEP 2018a).

The National Assessment of Educational Progress (NAEP)

This is the largest continuing, nationally representative assessment of U.S. students' aptitude in various subjects. Results are reported on subject-matter achievement, instructional experiences, and school environment for populations of students (NAEP 2017a). A video entitled: *Introducing NAEP to teachers* (NAEP 2012) explains main features of the assessment.

The Nation's Report Card is released annually containing results for different demographic groups of students according to gender, socioeconomic status and race/ethnicity. Individual results for students, classrooms, or schools are however not reported.

National assessments are conducted annually in 11 subjects including Mathematics, Science and Economics. These assessments are based on frameworks (that serve as guidelines for assessment planning or curriculum revision) as developed by the National Assessment Governing Board (NAEP 2018b).

For mathematics (NAEP 2017g) five content areas (number properties and operations, measurement, geometry, data analysis, statistics and probability, and algebra) are measured at three levels of complexity (low, moderate and high).

For science (NAEP 2017h) three broad content areas (physical science, life science and Earth and space science) with four scientific practices (identifying science principles, using science principles, using scientific inquiry, and using technological design) are measured.

For economics (NAEP 2017f), learners demonstrate economic literacy within three main content areas (the Market Economy, the National Economy and the International Economy). Three cognitive categories of comprehension are assessed (knowing, applying and reasoning). I could not find a specific framework for Accounting Sciences.

They began administering **digitally based assessments** (NAEP 2018c) for mathematics, reading, and writing in 2017 to align with school practices, because schools are increasingly using technology in the classroom to teach and assess students. Use the link: (https://nces.ed.gov/nationsreportcard/experience/) to view tutorials how the assessments work.

From the tutorials, I could see that the educational content illustrated is of high quality. Colour pictures, videos, sound (audio) and text are incorporated and the materials are well structured and interactive. Activities such as the 'toaster redesign' task for engineering literacy are topical and directly applicable to the learner's life. There are a good variety of tasks, such as interactive computer tasks, hybrid hands-on tasks, writing computer-based assessment and scenario-based tasks. There is a lot of scope and opportunity in South Africa to develop similar engaging educational materials to make available online.

South African Annual National Assessments

The Annual National Assessment (ANA 2018) and Literacy and Numeracy tests for grades 1-6 and 9 are done in South Africa each year. Van den Berg (2015: 1) highlights problems relating to the calibration, inter-temporal and inter-grade comparability of ANA test scores, reducing their usefulness for measuring learning gains. Analysis of ANA data confirms that South African school children perform weakly and below the international benchmark of TIMSS (Van Den Berg 2015: 13, 14).

I agree with Van den Berg (2015: 14) that early learning intervention in the lower grades is necessary, but much more support and intervention should also be provided for learners in higher grades as this is where many learners fail and drop out of the system (see supporting data in Chapter 1 Section 1.3). Very little South African research focusses on the FET phase and e-learning innovation. Mobile phones and digital devices lend themselves much more to the FET phase than the earlier phases, in my opinion, because learners are more mature and require less supervision. Thus, it is an appropriate medium for delivering educational content and learning support to the high school age group as previously stated in Chapter 1, Section 1.2. Van den Berg (2015: 14) motivates that better information on the learning trajectories of learners are necessary. An online system makes this possible by continuously monitoring and keeping track of learner activity and data as the learner progresses through school.

The Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) and South African Learner Achievement

TIMSS and PIRLS (2018) data provide perspective on country-specific educational systems in a global context. It can stimulate curriculum reform (Hastedt 2016) and measure the impact of new educational initiatives. TIMSS 2019 marks the debut of an electronic version of TIMSS and ePIRLS debuted in 2016. Assessments are for Mathematics and Science and are designed according to specific assessment frameworks (TIMMS 2019). Two introductory online videos entitled '*Introduction to TIMMS & PIRLS* (2016) and '*PIRLS International Achievement*' (TIMSS & PIRLS 2018) explain more.

Letaba (2017) provides a summary of South African performance on the 2015 TIMSS, indicating low percentages of students in grade 5 and 9 that perform at intermediate level and above in Mathematics and Science (only 14% in grade 9 and 17% in grade 5). Spaull (2013: 16-21) shows that from 1995 until 2011, South Africa has consistently lagged behind the TIMSS middle –

income country mean for mathematics and science in Grade 8. Spaull (2013: 11) proposes that the management of the South African education system should be improved to provide intervention tools that do not require high levels of capacity (an online system can achieve this). He also recommends moving towards results oriented mutual accountability and improved teacher performance and accountability. This is possible through an e-learning system where expert teachers present and record video lessons. Automated assessment tasks can be designed for progressive practice and mastery. A rating/feedback feature can facilitate teacher performance evaluation and monitoring.

Due to the digitalisation of all international benchmark tests for simplified implementation, improved administration and management, it is appropriate for South African education to follow suit to become more digitised for this new age.

The Condition of Education Report

Every year, in June, the NCES publishes a congressionally mandated annual report that summarises the latest educational data in the United States. The report is designed to help policymakers and the public monitor educational progress. The Condition of Education Report (2017) presents 50 indicators on topics ranging from pre-kindergarten through postsecondary education, as well as labour force outcomes and international comparisons. The NCES webpage (https://nces.ed.gov/surveys/annualreports/) provides a link to a video entitled: '*What is the Condition of Education?*' (Ed NCES 2017) explaining the history, purpose and indicators of the report.

Some of the indicators addressed in the report include: the level of educational attainment of young adults, the annual earnings of young adults, employment and unemployment rates, children's access to and use of the internet, public school revenue sources, public school expenditures, international comparisons in science, reading and mathematics, public high school graduation rates and status dropout rates. An overview of the

indicators and spotlight indicators measured in the report can be found on the webpage: https://nces.ed.gov/programs/coe/ataglance.asp .

The DBE does not collect or measure local education data corresponding to **all** the indicators presented in the US Condition of Education Report. In my opinion, it would benefit the South African public, educationists and policy makers if such data was measured, recorded and made publicly available. This will help to inform effective education policy and curriculum development, strengthen learner support services and aid teachers. An online system with built-in data collection functionalities and analytical and statistical software will enable such data be measured, analysed and presented timeously.

The fourth center of the IES is the National Center for Special Education Research. It supports training programs to prepare researchers for high quality, scientific special education research.

IV. *The National Center for Special Education Research (NCSER)*

Introduction

The NCSER sponsors comprehensive research for expanding the understanding of children with disabilities, or those who are at risk of developing disabilities.

The Compendium of Education Technology Research

The NCSER published a Compendium of Education Technology Research (Yamaguchi & Hall 2017) spanning from 2000 to 2014 of more than 400 education technology projects. These projects focussed on cognition, mathematics and science, reading, writing and language, academic content, social and behavioural outcomes, postsecondary education and assistive

technology. The purpose of the Compendium is to organize and make information accessible for all stakeholders.

I have not come across a similar initiative in South African education technology research. By compiling a compendium of South African education and technology research one could assist educators and policymakers to better (data driven) decisions, boost innovation and improve current systems and practices.

South African Education Research and Datasets

South Africa does not have an Education Institute or similar body involved with education research, data collection and providing statistical analysis such as the IES in the USA. Founding such an Institute to perform the same functions and support research would benefit South Africa greatly because it can help tailor national education programs and curriculum to target specific learner groups.

Van Wyk (2015) provides an inventory of all the current education datasets in South Africa that can influence policy development. The Master List of Schools (DBE 2017a), available on the DBE's website, provides provincial school data such as each school's: Natemis number (a unique school identifier), Sector, Phase, PaypointNo and ComponentNo, ExamNo, the geographical coordinates of the school, Quintile, Number of teaching staff and the Number of enrolled learners.

Other datasets include the SNAP survey (Van Wyk 2015: 6-8) and the Annual School Survey (ASS) (Van Wyk 2015: 9-11). These measure among others, learner enrolment and education staff numbers by gender, province and grade as well as numbers of computers per school, school fees, repeat students, learner pregnancy, learner and teacher mortality and learner subjects by phase and race.

The relevance, quality, completeness and accuracy of some data elements in the survey are questionable (Van Wyk 2015: 4, 6) and should be updated. Van Wyk (2015: 20) also recommends that SNAP and ASS data should be made more accessible and presented in a user friendly file formats that can be downloaded (such as a comma delimited text file, spreadsheet or database) to assist with research and analysis of data. I tried to export the Master List of schools, but it is only downloadable in PDF format, which requires manual counting. This is very difficult and error-prone, given the large volume of data. As mentioned, an e-learning system can improve student data collection, analysis and monitoring (which occurs continuously and automatically as the learner progresses through school). Data can be presented in simplistic and user-friendly formats as spreadsheets/graphs/summaries that are consistently updated in 'real-time'.

Section 5.1.7. highlights the provision in White Paper 7 for a legislated e-rate to South African schools and libraries (DBE 2004: 32), this ideal has however not been implemented (ISPA 2017). The Federal Communications Commission (FCC) of the USA successfully runs and E-rate program with funding from a Universal Service Fund (USF 2018). More on the US E-rate program is explained in the following section:

US E-rate Program

The Federal Communications Commission offers an E-rate program (FCC 2018) that makes telecommunications and information services more affordable to schools and libraries by offering discounts ranging from 20%-90% off for internet service costs.

The funding cap for 2015 was approved at $3.9 billion and indexed to inflation for future periods. The Universal Service Fund provides the funding for this program

which focusses on broadband service provision to expand Wi-Fi access for educational institutions.

Eligible schools and libraries identify the services they require and then submit a request for competitive bids to the Universal Service Administration Company (USAC). USAC posts these request on their website for vendors' analysis. After consideration of offers, the school/library then selects its preferred vendor(s) and applies to the USAC for approval of the desired purchases.

I think the implementation of an e-Rate program for schools and libraries in South Africa, such as the US E-rate program is essential for optimising e-learning nation-wide.

Conclusion

Geographically, the USA is about eight times larger than South Africa (10 million km^2 as compared to 1.2 million km^2) (Farnsworth 2017, AllCountries 2018)). The U.S. population greatly outnumbers the South African population (325+ million people compared to 56+ million people) (US Census Bureau 2018, World Bank 2018).

US internet and educational infrastructure has been developed to function effectively across wider geographical distances and to accommodate a greater number of people. This shows that successful e-learning implementation is definitely possible in a smaller-scale country such as South Africa. By developing and administering a national e-learning system, better statistical research can be conducted and education innovation facilitated.

Finland is smaller in size (338 424 km^2) (Wikipedia 2018b) than South Africa, and the overall population is also much less (5,51 million people according to the World Bank (2018)). Finnish high school learners are internationally renowned for achieving high results in Mathematics and Science in the tri-annual Programme for

International Student Assessment (PISA) (although results from the past 2015 PISA test show that Singapore came out tops (Anderson & Wang 2016)), therefore, I have chosen to investigate Finland's education system for comparison to that of South Africa.

5.2.2. EDUCATION IN FINLAND

Introduction

Education in Finland is largely decentralised and fully subsidised with meals served to full-time students. The European Commission's Eurydice Platform (https://eacea.ec.europa.eu/national-policies/eurydice/home_en) (Eurydice 2017) provides a comprehensive overview of the main features of the Finnish Education system.

All learners in Finland attend a nine-year compulsory basic comprehensive school starting at age 7. The New comprehensive school action plan (MoEC 2016) sets out goals for Finnish education. Teachers in Finland must be highly qualified and hold a Master's degree. Teachers are given high social status in Finland and their professionalism is promoted throughout their careers (Google for Education 2016: 11-15). All teachers in Finland are given access to massive open online courses and other opportunities to continue their individual professional development as per their unique needs. Tutor teachers function in every school to assist teaching staff with the best way to harness digitalisation in their work. In this way competencies are disseminated and co-operation between teachers is strengthened. Teachers are not evaluated by external or formal measures (FNBE 2013).

Other noteworthy undertakings include: The Finnish National Board of Education (FNBE) that supports collaborated pilots and trials in new solutions, innovation activities and technologies. And financial resources (grants) that are channelled into best practices and procedures for school development based on current research trends and results. The Finnish National Board of Education maintains a web

service: https://www.edu.fi/etusivu, to support teaching and learning development and ICT implementation. Learning materials, research publications and video training can be found on this website. South Africa's Thutong education portal (http://www.thutong.doe.gov.za/mathematics//Mathematics/tabid/293/Default.aspx) serves a similar function, but I found EDU.fi to be more user friendly, better laid-out, less cluttered and easier to navigate than the Thutong website. I also could not find any video tutorials for teachers on the Thutong website.

Finland has a two-tiered National Education Administration composed of the Ministry of Education and Culture (MoEC) and the Finnish National Agency for Education (EDUFI). The MoEC is involved with establishing and implementing Education Policy, preparing Legislation and providing and administering State funding. The Finnish National Agency for Education is involved with establishing and developing National Core Curricula and qualification requirements, providing support for evidence- based policy creation, educational reform and development. EDUFI administers service provision for learners and promotes and supports the internationalisation of schools (EDUFI 2018c: 8). An organisational chart (EDUFI 2017) from the National Agency for Education website breaks down the departments and operations of the agency.

The Ministry of Education and Culture

The Finnish Ministry of Education and Culture (MoEC) prepares laws and oversees the administration of education (day-care, schools and universities), culture (museums, libraries and arts) and sports and science (MoEC 2018).

Basic Education in Finland encompasses nine years from when learners are between 7 and 16 years old (EDUFI 2018a). Schools do not select their students, students are allocated to a nearby school, but they may choose another school within certain conditions. Learners follow a National Core Curriculum for Basic Education (FNBE 2014).

Basic Education

The Finnish Basic Education Act (628/1998) governs basic education in Finland. The Finnish Basic Education Act is streamlined and only 24 pages long. This is very practical and more easily understandable for the reader. When education laws are to-the-point and not too difficult to digest or follow, it facilitates compliance and enables more energy and resources to be channelled into value-adding activities and initiatives such as enhanced teaching and curriculum development.

The Finnish Basic Education Act consists of 9 Chapters and deals with diverse issues including language of instruction, education content, religious education and ethics, lesson hours, curriculum, remedial teaching, special-needs education and support, piloting, evaluation and assessment. The Finnish school year is only 190 days long (Finnish Basic Education Act 1998: 11) (The South African school year for 2018 & 2019 in comparison is more than a week longer - 199 days according to Blaauwberg Online 2018). In South Africa's case, concise and quality lessons presented online can help to finish the school curriculum sooner, making more time available for school holidays.

Other sections in the Finnish Basic Education Act include the right to a safe learning environment, the right to instruction, free education and school travel (if the distance that a pupil must travel to school exceeds 5 kilometres, the pupil is entitled to free transportation). Section 36 deals with learner discipline and what actions may be taken if a learner disrupts a class or acts in a violent or aggressive manner. Chapter 8 (Section 48) handles before and after school activities.

I found this legislative document to be concise, easily comprehensible and extensive. South Africa can learn from Finland and review our legislation and policies to make them more streamlined, to the point, learner-centred, practical and relevant for this day and age.

After compulsory basic education, Finnish learners can choose to attend either general or vocational upper secondary education for three years (EDUFI 2018d).

General Upper Secondary

General upper secondary education (EDUFI 2018d) is free of charge, but a fee may be payable for certain subjects and for the Finnish matriculation examination. Textbooks and teaching materials must also be bought, but financial aid is available for full-time studies in general upper secondary school. The selection of students for upper secondary school is based on their grade point average for theoretical subjects. Entrance and aptitude tests may be used and students may be awarded points for hobbies/other relevant activities.

There is also National Core Curriculum for General Upper Secondary Schools (FNBE 2015). Students are typically between the ages of 16-19 years in upper secondary education. Education is not divided into grades and teaching is not tied to year classes in Upper Secondary. A school year is divided into two semesters, not four terms as in South Africa.

Vocational Upper Secondary

The webpage for Vocational Upper Secondary Education (EDUFI 2018e) provides a list with 56 vocational qualifications that learners can pursue. Each qualification has a requirements document stipulating amongst others the objectives and structure of the qualification, the national curriculum-based requirements for completing such a competence-based qualification, the modules, skills specifications and assessment, objectives and assessment of core subjects and free choice (elective) subjects. These documents serve as official regulations. Pre-vocational instruction and guidance programmes are in place to support the transition between basic education and upper secondary level, this serves as preparatory education for immigrants. Courses are however, only provided in Finnish or Swedish. Almost fifty percent of relevant age group learners apply for Vocational Education and Training (VET) in Finland (FNBE & MoEC 2015: 10). The biggest VET sectors are technology, communications and transport, social services, health and sports (FNBE & MoEC 2015: 11). Finland participates in the World Skills, Euroskills and Ambilympics contests. In-service training is mandatory in most fields of VET.

The European Commission (Eurydice 2017) provides more information on Upper Secondary education in Finland including 1) the organisation of general upper secondary and vocational education (such as educational institutions, geographical accessibility, admission requirements, grouping of students and the organisation of school year, day and week), 2) teaching and learning in general upper secondary and vocational education (the curriculum, school diplomas, distribution and number of lesson hours, teaching methods and materials), and 3) assessment in general upper secondary and vocational education (including grade scales used, student progression, certification, apprenticeship training etc.).

The Upper Secondary Schools Act (1998/629)

Finnish Upper Secondary Education is regulated by the Upper Secondary Schools Act (1998/629). Many of the principles and issues dealt with in the Basic Education Act (1998) appear again in the Upper Secondary Education Act (1998). The Upper Secondary Education Act has 7 chapters. Chapter 3 (Sections 6 to 15) deals with teaching (language of instruction, scope and content of teaching, mother tongue instruction, curriculum, religion and knowledge of life, organisation of training and special education). Chapter 4 (Sections 16 to 18) includes assessment, evaluation and the matriculation examination. And Chapter 5 (Sections 19 to 26) entails the rights and obligations of learners, including disciplinary measures and procedures.

The Finnish National Agency for Education

The Finnish National Agency for Education provides a booklet setting out key principles in Finnish Education (FNBE 2017). What stood out for me was that 1) Education is free at all levels including meals and transportation, 2) Guidance and counselling is an educational right of every child, 3) Quality assurance is based on steering instead of control (FNBE 2013) (funding, support and information is provided to assist schools. Self-evaluation of schools is promoted and national sample-based evaluations of learning outcomes are conducted to determine how well learning objectives have been met as per core curricula and qualification stipulations. Schools are not ranked according to these results and school

inspections do not take place), 4) General upper secondary education is flexibly structured for students to complete in 2 to 4 years. Thus the gifted learner is not held back and slower learners are given enough time to complete their secondary education at a more manageable pace. 5) Vocational qualifications are developed in co-operation with the world of work to ensure that flexible and efficient transition into the labour market is supported and 6) there are no national tests for learners in basic education in Finland.

Education, training and demand for labour in Finland

The report on education, training and demand for labour in Finland by 2025 (FNBE 2012) provides insight on the long-term quantitative anticipation of demand for labour and educational needs for international experts. They project the total need for new labour in specific industries and fields and so determine the educational and training needs that must be met for the world of work.

In South Africa there is not yet an institutional mechanism providing credible information and analysis with regard to the supply and demand for specific skills. It would benefit South Africa to make projections for intakes in specific educational fields such as Technology, Communications and Transport, Mining, Manufacturing, Agriculture, Social Services, Health and Sport, Business and Administration, Tourism, Catering and Domestic Services, Humanities and Education, Natural Sciences, Natural Resources and the Environment, Security and Military as per the Finnish report. An online system and framework can assist in measuring, monitoring and forecasting demand and supply for specific skills.

The report of the European Commission entitled: Rethinking Education: Investing in skills for better socio-economic outcomes (European Commission 2012) highlights the importance of developing transversal skills (critical thinking, digital skills, initiative, problem solving and collaboration) and entrepreneurial skills (European Commission 2012: 3) for youth to succeed in the 21st century. Foreign language learning is prioritised as well as increasing the quality of vocational skills through world class VET systems to address skills shortages. The European Union and the

Organisation for Economic Co-operation and Development (OECD) launched an online Education & Skills Assessment (http://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/) as an assessment tool for individual-level results for any person measuring literacy, numeracy and problem solving in technology-rich environments. It is linked to the OECD Survey of Adult Skills that measures key cognitive and workplace skills. The data from the Survey can be used to inform policy decision-making. I do not know of a similar skills assessment testing system in South Africa. Again, an online system can have such skills assessment functionality as part of the design.

Conclusion

Jezard (2017) writes that schools in Finland are being redesigned to break down walls between classrooms and eliminate divisions between subjects and learner ages. Learning is to become more 'multidisciplinary' and phenomenon-based where learners are more involved in the planning and assessment of lessons (Will 2016). The World Economic Forum provides a summative video (Jezard 2017) of the main features of Finland's education system.

Malawi is a smaller country than Finland (118 480 km^2) (Nations Encyclopaedia 2018) and a member of the Southern African Development Community (SADC) like South Africa. It is one of the lowest income countries in the world with 46% of its population between the ages of 0 and 14 years (Dube 2017: 83). The country struggles with poverty, low academic achievement and a lack of resources and educational infrastructure such as school libraries (Dube 2017: 83, 84). An e-learning system can maintain a digital library of resources (pictures, tutorials, videos and virtual expeditions) which becomes accessible to learners via their mobile device. Further analysis of the Malawian education system and policy documents follows.

5.2.3. EDUCATION IN MALAWI

Introduction

There are 3 Governmental Ministries that exercise legislative control over the education system in Malawi: the Ministry of Education, Science and Technology (MoEST), the Ministry of Labour (MoL) and the Ministry of Gender, Child and Community Development (MoGCD). The involvement of the Ministry of Labour shows that effort is being made to employ graduates from the education system.

The Malawian Ministry of Education, Science and Technology (MoEST) aims to provide quality and relevant education and to promote science and technology teaching and learning and science-led development. I downloaded some of the education policy documents from the MoEST website, but the links to the National Education Policy and Strategic Plan do not function. A discussion of other key policy documents from working links follows below.

The Education Act (Government of Malawi 2013a)

Malawian education was governed by the 1962 Education Act for more than 50 years (Kondowe 2015). The process to revise the Education Act only commenced in 2003 and according to Kondowe (2015), the passing of the law was delayed for approximately 10 years until 2013. A summary of the 11 parts of the Education Act follows below:

- **Part I** - General principles on the promotion of education by the Minister
- **Part II** – Establishment of a general Advisory Council and special Advisory Council and the constitution of the Councils
- **Part III** - Provision for expenditure of public funds by the Minister for education
- **Part IV** - The establishment, duties and powers of Local Education Authorities and Local Education Boards
- **Part V**- The management of Government schools

- **Part VI** – Procedures for establishing schools, closing, reopening and taking possession of schools and the power of the Minister to enter and inspect schools
- **Part VII –** The registration and licensing of teachers, the Teacher's Board of Appeal and offences relating to teachers
- **Part VIII** – The syllabus to be followed in schools and modalities for religious instruction
- **Part IX** – Duties of learners to obey the headmaster and medical inspections of learners
- **Part X** – The power of the Minister to prescribe school fees
- **Part XI** – The power of the Minister to make rules, the general penalty for offences, service of notices and other documents

A key feature of the new Education Act was the provision for free and compulsory primary education to every child below 18 years of age in public government schools (Government of Malawi 2013a). This has been instrumental in advancing education access and boosting enrolment, but the quality of education has waned as a result. Dube (2017: 84) writes that primary level literacy and academic achievement in Malawi is still very low. There has not been a similar "free education" provision made for secondary education in Malawi.

Education Sector Implementation Plan II (2013-2018) (Government of Malawi 2014)

According to this implementation plan, secondary enrolment in Malawi is also very poor (Government of Malawi 2014: 28). The number of secondary schools in Malawi is estimated at 1008 with approximately 346 604 learners (Thomas 2017: 86) and classroom pupil ratios are very high 52:1 against a target of 40:1 (Government of Malawi 2014: 29). There is a shortage of qualified science teachers and inadequate distribution of teaching and learning materials to schools (Government of Malawi 2014: 30, 31). Special needs learners are mainstreamed with other learners in some selected schools and regular teachers are not trained or capable of working with learners with special needs (Government of Malawi 2014: 32).

According to DeStefano (2013) the supply and demand of teachers in Malawi has been extremely out of balance for in excess of fifteen years with severe shortages. DeStefano (2013) also mentions severe budget constraints limiting teacher training and deployment.

In 2010 the World Bank approved a Project to Improve Education Quality in Malawi, targeting the primary school phase specifically (World Bank 2010a). Some of the objective indicators of the project included: improved enrolment rates in primary school, reduced pupil-teacher and pupil-classroom ratios, increases in qualified primary teachers and the procurement of textbooks and other learning materials (World Bank 2010b). The total cost of the project was US$ 256 million and the project closed in 2015. There has not been a similar project for the secondary phase.

Secondary schooling in Malawi is offered in 3 types of schools: Conventional Secondary Schools (CSSs), Community Day Secondary Schools (CDSSs) and private schools (Thomas 2017). CSSs are government supported and the most advantaged, but CDSSs are the most disadvantaged (Thomas 2017: 86). Secondary learners write the Malawi School Certificate of Education (MSCE) Examination at the end of Form 4. In 2012/13 only 52.48% of students who wrote the MSCE passed. Over the four year period, 2009-2013 more than 50% of female learners who sat for the MSCE examinations failed to pass (Government of Malawi 2014: 32).

National Education Standards (MoEST 2015)

In line with Section 4 of the Education Act of 2013, the Malawian National Education Standards prescribe minimum requirements for education provision to improve overall quality of education across the country (MoEST 2015: II). These standards can aid policy makers at national, divisional and district level to evaluate education effectiveness and guide individual institutions and practitioners in reviewing and improving their practice (MoEST 2015: III).

The National Education Standards are categorised into 3 broad areas (MoEST 2015: 7):

1. Outcomes
2. Teaching Processes
3. Leadership and Management Processes

The National Education Standards document (MoEST 2015: 8-10) lists the areas and provides explanations for the standards pertaining to each as illustrated in Table 14.

Table 14: The National Education Standards

AREA	No	EDUCATION STANDARD
Outcomes for students	1.	Learning in lessons
	2.	Students' outcomes in the curriculum
	3.	Attainment across the school
	4.	Students' participation in education
	5.	Students' behaviour and involvement in school life
	6.	Students' safety and protection
The Teaching Process	7.	A curriculum which is appropriate and relevant
	8.	High expectations
	9.	Teachers with good professional, subject and
	10.	curriculum knowledge
	11.	Well-planned lessons
	12.	Teaching for effective learning
	13.	Accurate and constructive use of assessment
	14.	Teaching which meets the needs of all students
		Effective management of behaviour
Leadership	15.	Vision, goals and values
	16.	School self-evaluation and improvement
	17.	School governance
	18.	School leadership
Management	19.	Partnership with parents and the community
	20.	Staff supervision and development

	21.	Staff deployment and management
	22.	Care and welfare of students
	23.	Access, equity and inclusion
	24.	Management of buildings and facilities
	25.	Management of material resources
	26.	Financial management

(Source: MoEST 2015: 8-10, 14)

Compliance with each standard can be evaluated according to 4 levels of achievement. Level 1 = Below minimum standards, Level 2 = Meets minimum standards, Level 3= Exceeds minimum standards and Level 4= Effective Practice.

The rest of the document (MoEST 2015: 15-42) stipulates what specific requirements must be met for every level of achievement for each of the 26 educational standards. It also indicates the evidence sources for each standard that must be evaluated or measured and provides links to other standards. This document is, in my opinion, a comprehensive, concise and step-by-step document, easily understandable by someone with relatively limited knowledge or experience.

I searched for Malawi's curriculum statements (such as CAPS in South Africa), but did not find anything of relevance.

Science and Technology Policy (National Research Council of Malawi 2002)

The Malawian government acknowledged the importance of science and technology as early as 1974 when the National Research Council of Malawi (NRCM) was established. But a National Science and Technology Policy was only developed in 1990 (UNESCO 2014b: 38).

Although widely accepted, this policy has not been fully implemented due to the pluralistic approach of the country to manage science and technology, the lack of integration of the policy in the government's overall development plans, a lack of

human, financial and material resources and a lack of necessary supporting legislation (UNESCO 2014b: 89). Malawi lags behind in the area of ICTs because there are too few telecentres for efficient telecommunications. Furthermore, weaknesses in the education sector due to inadequate funding, resulted in a shortage of qualified and motivated science and mathematics staff and a lack of equipment, thus making innovation unobtainable (UNESCO 2014b: 89). Respondents of the Stakeholders' Post-2015 Development Agenda pointed out that 'children should be introduced to computers at a tender age' because that would enable the emergence of a technologically oriented future generation (UNSECO 2014b: 38).

The United Nations Development Programme assisted the NRCM to develop a New Revised Science and Technology Policy in 1997/8 (UNESCO 2014b: 90).This policy sets out guiding principles and an institutional and legal framework for the development and application of science and technology for poverty reduction, emphasising biotechnology, biosafety and information and communication technologies (ICTs) (UNESCO 2014b: 100). The policy also established mechanisms to promote participation of women and indigenous minorities in the development and utilization of science and technology (UNESCO 2014b: 102)

According to UNESCO (2014b: 168-176) the government of Malawi has also enacted a Technical, Entrepreneurial, Vocational Education and Training Act (1999), Science and Technology Act (2008) and ICT Policy (2013). I do not attempt to discuss these for the purposes of this study.

Harmonization of Education in SADC countries

A Comparative Report on the Education Landscape of Countries in the Southern Africa Association for Educational Assessment (SAAEA 2014) provides an overview of education systems of nine countries within the Southern Africa Development Community (SADC) namely: Botswana, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. The report does not address e-

learning strategy, development, infrastructure or implementation, but it does provide perspective on overall educational structure, curriculum and assessment.

According to the report Botswana and Zambia are progressing toward web based integrated examinations processing systems and Zimbabwe is already administering e-testing and e-marking (SAAEA 2014: ix). Mention is also made of a 'project for the harmonization of education systems and the need to set common standards across the SADC region' (SAAEA 2014: x). An e-leaning system can achieve the ideals of 'harmonization' between education systems and implementing common standards. Eventually e-testing and e-marking can be introduced in accord with internationally benchmarked tests such as eTIMMS and ePIRLS.

Nyamundundu-Majarawanda (2015: 257) writes about the role of leaders in Training and Development in Malawi. She observes that leaders have a challenging task to keep up with technology and not to fall behind. She proposes that University degrees must be combined with information technology to improve marketability of trainees. All modern-day vocations require 'digitally fluent' and capable employees. People nowadays need to work across multiple platforms, and digital networks using a variety of software programs. I agree that technology should be introduced to learners at a young age in schools. An e-learning system targeting secondary schooling can make training practical, consistent and relevant to the needs of the people (Nyamundundu-Majarawanda 2015: 260).

Bwalya, Du Plessis and Rensleigh (2013) write about the strategic initiatives made and factors that impact e-Government adoption in Botswana, Mozambique and Malawi. Malawi has not yet achieved much on the e-Government front (Bwalya et al. 2013: 63). The country does have a National ICT Policy (Government of Malawi 2013b) with the envisaged outcome: to increase access to "basic health and educational facilities and increased skills in ICT" which can create a "higher education status for the country due to increased access to education and learning materials at all levels of education" (Government of Malawi 2013b: 6).

Conclusion

Malawi is a SADC country that could benefit from e-learning alternatives and an e-learning system. More students can gain access to expert instruction which can be provided at a much lower cost. A comparative summary with key characteristics of each of the four countries' education systems follows on the next page.

5.2.4. COMPARATIVE SUMMARY OF EDUCATION SYSTEMS AND POLICIES

The following table provides a summary of key features of the education systems investigated in this study for purposes of comparison and easy referencing.

TABLE 15: SUMMATIVE TABLE OF EDUCATION SYSTEMS AND POLICIES

	South Africa	**United States of America**	**Finland**	**Malawi**
Education System	• Centralized • Free Basic Education Policy • Shortage of skilled secondary teachers	• Decentralized • Advanced ICT infrastructure and implementation in education • Digital Standardised Testing	• Decentralized • Fully Subsidised (Free at all levels including transportation) • Highly qualified teachers • Teachers' professionalism highly promoted	• Moving towards Decentralization • Free Basic Education Policy • Shortage of skilled secondary teachers • Overcrowded classes and low quality education challenges • Very limited ICT infrastructure and use of ICTs in education

Structure	General Education and Training Phase (Gr 0- 9) Further Education and Training Phase (Gr 10-12) 4 school terms	Pre-School = Gr 0 Elementary= Gr 1-5 Middle-school = Gr 6-8 High School = Gr 9-12 2 semesters	Basic Education 7-16 years old Upper Secondary Education and Training Phase • General • Vocational 2 semesters	Basic Education Secondary Education
Governing Bodies, Standard Setting Bodies and Research Institutes	The Department of Basic Education and Training (DBE) NADEOSA NCSNET	Department of Education (ED) The Institute of Education Sciences (IES)	The Finnish Ministry of Education and Culture Finnish National Agency for Education	The Ministry of Education, Science and Technology The Ministry of Labour The Ministry of Gender, Child and Community Development

Education legislation/ Policy Documents	White Papers 1,2,4,6,7 Norms and Standards for Educators Draft National Policy for the Provision and Management of Learning and Teaching Support Materials (LTSM)	ESSA FERPA IDEA Education Policy is set at state/district level and varies between states	Basic Education Act 628/1998 Upper Secondary Schools Act 629/1998	The Education Act (2013) Education Sector Implementation Plan II (2013-2018) National Education Standards (2015) Science and Technology Policy (2002)
Curriculum Statements/Standards	CAPS Curriculum IEB Curriculum	Common Core Standards	National Core Curriculum for Basic Education National Core Curriculum for Upper Secondary Education	No curriculum found. Certain schools in Malawi follow the UK Cambridge (IGCSE) curriculum National Education Standards (2015)

National Assessments	National Senior Certificate (NSC) Independent Examinations Board Examinations (IEB) Annual National Assessment and Literacy (ANA)	National Assessment of Educational Progress (NAEP) American College Testing (ACT) Suite of Assessments (SAT)	No national tests for Basic Education. Upper Secondary is flexibly structured so that learners can complete it in 2-4 years.	Secondary learners write the Malawi School Certificate of Education (MSCE)
E-Rate Program and Discounts	Proposed in White Paper 7 but not yet effective	Yes	Unknown	None
Online Education Portal	Thutong	States maintain individual online education portals	EDU.fi	None

5.3. SYNTHESIS OF RESEARCH FINDINGS

Aluko (2017) recommends that South Africa establishes a dedicated policy for mobile learning. Many of South Africa's education policy documents were approved in a 'pre mobile' era and do not seek to maximise the learning potential of mobile technology (Kraut 2013:29). The UNESCO mobile policy guidelines (Kraut 2013) can inform the drawing up of new policy for mobile teaching and learning.

Finland's concise, effective education legislation serves as exemplar for the revision of outdated South African white papers. In my opinion, streamlined policy and legislation facilitates understanding and compliance. South Africa needs to remove and/or replace redundant policy and ineffective legislation such as the Norms and Standards for Educators and tailor policy to be more in line with international developments in education and digitalisation.

An e-learning system can continuously keep track of and monitor learner activity and progress. This facilitates and improves the timeous collection, measurement, recording and analysis of educational data to aid effective decision-making by policy-makers, teaching staff and other educational stakeholders. Much more must be done in South Africa with regards to technology and education research. By founding an institution similar in function and responsibility to the IES of the USA, education innovation can be boosted and current systems and practices improved.

The digitalisation of international benchmark assessments such as eTIMSS and ePIRLS motivate for the development of a harmonized, standardised e-learning system with quality curriculum content and expert instruction for learners throughout Africa. Malawi is an SADC country that would benefit from such an alternative, given the shortage of capable teachers, low quality of instruction and high drop-out and failure rates among secondary learners. Vocational courses for on-the-job training can also be provided via this system.

There is also opportunity to improve the online DBE Thutong portal to be more user-friendly and easily navigable. Videos that provide training for teachers and a database with educational content arranged according to CAPS curriculum topics should be developed. Implementing and administering a legislated e-Rate is crucial to advance e-learning adoption and innovation in South Africa.

5.4. CONCLUSION

Part 1 of this chapter critically evaluates South African education policy documents (i.e. White papers 1,2,4,6 and 7, the Norms and Standards of Educators and the Draft policy statement on Learning Teaching and Support Materials). Key mobile learning policy guidelines provided by UNESCO (2013) are discussed with the aim of informing effective education policy creation, revision and renewal.

Part 2 of this chapter explores and compares the education systems and education legislation of the USA, Finland and Malawi to each other and to South Africa. Advancements in the digitalisation of international benchmark tests (TIMMS and PIRLS) and other assessments provide reason for South Africa to follow suit toward digitalising education provision. A summative comparative table of the education systems and structures of these countries is provided in Section 5.2.4.

In Chapter 6, the proposed e-learning framework for Africa is presented and recommendations are made for further research and study.

CHAPTER 6: SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND A PROPOSED E-LEARNING FRAMEWORK FOR AFRICA

6.1.   INTRODUCTION

In Chapter 5, I descriptively evaluate relevant South African education policy documents with reference to UNESCO's mobile learning policy guidelines. Education systems and legislation of the USA, Finland and Malawi are critically analysed for comparison to South Africa and each other.

Chapter 6 provides summaries of the literature review and comparative study. An e-learning framework for mobile devices in Africa is proposed as conclusion to this study and recommendations are made for further research.

6.2.   SUMMARY OF THE LITERATURE REVIEW OF E- AND M-LEARNING FRAMEWORKS

The literature review in Chapter 2 investigates seven existing e- and m-learning frameworks (the Global E-learning Framework, Mobile CSCL Framework, M-COPE Framework, Pedagogical Framework for Mobile Learning, SECTIONS Framework, M-Learning Framework and the Pedagogical Framework for an E-learning System).

Learning theory underpinning each framework was explained and unique features of each framework highlighted. Reference is made to other researchers' application, opinions and/or analyses of these frameworks, to present an unbiased, evidence-supported impression of each. A tabular summary of the frameworks with key features were presented in Section 2.3

6.3. SUMMARY OF THE COMPARATIVE STUDY OF EDUCATION SYSTEMS AND EDUCATION POLICY OF SOUTH AFRICA, THE USA, FINLAND AND MALAWI

In Part 1 of Chapter 5, South African education policy and legislation is descriptively evaluated to establish whether the undertakings and commitments formulated in these documents have been realised. It is evident that many educational problems, past and present, have not been addressed adequately (see Sections 1.2, 1.3 and Sections 5.1.1. to 5.1.7) despite the large volumes of policies and action plans published. Most South African education policy documents originated in a pre-digital era and do not leverage mobile device capabilities for education delivery and optimisation. Old and outdated policies should be removed or replaced. Ineffective and impractical legislation such as the Norms and Standards for Educators (2001) must be removed or revised. The UNESCO Policy guidelines for mobile learning (Kraut 2013) can advise effective mobile education policy creation in South Africa.

Part 2 of Chapter 5 evaluates the education systems and education legislation of the United States, Finland and Malawi for a critical comparison to that of South Africa. A tabular summary of key aspects of each country's education system is presented in Section 5.2.4. This comparative study highlights fundamental areas for development and rectification in the South African education system including:

1. The collection, measurement and presentation of educational indicators and learner data and progress and that is timeous, accurate, complete and useful for decision-making by policy-makers and other stakeholders (Van Wyk 2015: 4, 6). A properly written e-learning system can facilitate this data collection, measurement and analysis process.

2. The implementation of a legislated e-Rate.

3. The founding of an Education Research Institute, similar in role and function to the IES in the USA to drive and support education research and innovation, especially with regards to technology and digitalisation.

4. The development and expansion of the Vocational Educational stream in South Africa. By considering how the Finnish Vocational Upper Secondary Education (EDUFI 2018a) is structured and administered, South Africa can expand and optimise current local course offerings, training facilities, educational infrastructures and accessibility. An e-learning system can play a key part to provide information with regards to the supply and demand for specific skills in South Africa.

5. The redesign of the DBE's Thutong online education portal, to be more user-friendly and better laid-out with a database of quality e-learning materials and teacher training videos.

6.4.   CONCLUSIONS

Conclusions for this study will be presented as answers to the research questions stated in Chapter 1 (Section 1.8). Sub-questions 1.8.1 to 1.8.4 will be addressed first before introducing the proposed e-learning framework as answer to the main research question: *"What would an optimal e-learning framework for learners in grades 10, 11 and 12 consist of?"*

Each sub-question with its corresponding answer follows below:

1.8.1. What e-learning and m-learning frameworks supported by relevant educational theory and pedagogical principles have already been developed?

The literature review in Chapter 2 deals with this question in depth. A summary of 7 frameworks (with unique characteristics, underlying learning theory and relevant website links) are provided in Section 2.3.

In Chapter 3 (Sections 3.3.1 to 3.3.4) Behaviourism, Constructivism and Connectivism were selected and motivated as fundamental educational theories to underlie and support an e-learning framework for mobile devices for the diverse African context. Research developments and advancements to

these theories and contributions from scholars, educationists and psychologists were investigated and discussed in depth, across time.

1.8.2. How does current South African education law and policy support e-learning?

E-learning administration and management is addressed in White Paper 7 (DBE 2004) and the Draft National Policy for the Provision and Management of LTSM (2014), but there is no dedicated policy pertaining to mobile learning in South Africa (Aluko 2017). UNESCO (Kraut 2013) provides guidelines for developing such a mobile learning policy. These guidelines are discussed in Chapter 5, Section 5.1.9. Most South African education policy was formulated in a pre-digital era. These documents have served a past purpose, but are now redundant.

Recurrent themes running through South African education policy include: 1) enabling equal educational opportunities for all learners in South Africa, 2) providing quality education to all, 3) removing barriers to learning so that education is inclusive, and 4) vocationalisation and skills-based training for better employment opportunities. An e-learning system can help address all these pertinent issues by providing mobile educational courses in micro-format to more learners to help raise overall educational standards. The system can automatically monitor and keep continuous track of learner progress and data for analytical purposes, labour/skills forecasting, policy decision-making, and instructors' professional development. It can also facilitate communication with other stakeholders such as parents. White Paper 7 makes provision for a legislated e-rate to schools and libraries, but this has not yet been implemented (ISPA 2017).

1.8.3. How is education structured, regulated and managed in other first and third world countries and what developments in e-learning have taken place?

Chapter 5 Part 2 provides perspective on education structure, governance and e-learning implementation in the USA, Finland and Malawi. A summary of key aspects of each country's education system is given in Table 16 (Section 6.3) for comparative purposes and easy reference. I mention key aspects of each country's education system below:

Both the USA and Finland have decentralised education systems. The digitalisation of education and standardised testing is most advanced in the USA. The Institute for Educational Sciences conducts educational research, analyses educational data nation-wide and reports research results in the form of a Condition of Education Report (with more than 50 educational indicators) and a Compendium of Education Technology Research. South Africa does not have a similar institute providing these services.

Education is fully subsidised in Finland (including transportation) with meals served to students. Finland implements a general secondary and vocational secondary stream with 56 skill-specialisations that students can choose from. Finnish teachers are highly specialised and respected. Secondary education is flexibly structured and learners can complete it within 2-4 years. Finnish Education legislation is stream-lined and to-the-point, facilitating understanding and compliance. South African education policy must be revised for clarity of purpose and practical execution. South Africa is in the process of developing a 3rd vocational education stream, but implementation will take time (Simkins 2017, BusinessTech 2018).

Malawian secondary education is challenged by large under-enrolment rates, shortages of specialised teachers and infrastructure, low literacy levels and poor academic achievement. E-education implementation is very limited in schools, thus Malawi is an SADC country that could benefit from an e-learning framework for Africa.

1.8.4. Which specific elements must be included in an effective e-learning framework for instructional design for mobile devices to benefit learners in South Africa and Africa?

This question mirrors the main research question. When considering the educational context, current policy landscape (Sections 5.1.1. to 5.1.9.) and challenges that South Africa and African countries like Malawi face (see Sections 1.2 and 1.3 and Section 5.2.3), as well as 1st world developments with regards to education digitalisation (Sections 5.2.1 to 5.2.4.), then this is an opportune time to propose an effective e-learning framework for mobile devices in Africa. Africa is forecasted to have a population of 2.4. billion people by 2050 (Mills, Obasanjo, Herbst & Davis 2017: 6) which will be much younger than the rest of the world and digitally connected (Mills et al. 2017: 8). There is thus a large untapped potential market for quality education and training at lower costs via mobile.

My proposed e-learning framework is designed for the African context specifically. As explained in Chapter 3, the 3 learning theories underlying this proposed e-learning framework are: Behaviourism, Constructivism and Connectivism (please refer back to Section 3.3. for a detailed discussion of each theory). The name of the framework is the SAFER E-learning framework. Every letter in the framework's title represents key aspects or functions pertaining to e-and m-learning provision in Africa. **S** = ***South Africa, Students, Systemized*** and ***Standardized*** education delivery. **A** = ***Alternative, Accessible*** and ***Affordable*** education, **F** = ***Facilitation*** and ***Fast Feedback***, **E** = ***Ethical, Easy to use*** and ***Effective***, **R** = ***Rewards*** and ***Results***.

I illustrate and explain the SAFER E-learning framework in detail on the next page.

6.5. AN E-LEARNING INSTRUCTIONAL DESIGN FRAMEWORK FOR MOBILE DEVICES IN AFRICA

FIGURE 9: THE SAFER E-LEARNING FRAMEWORK

Every letter in the title 'SAFER' pertains to specific features of an e-learning/m-learning system. A discussion of each individual element of the SAFER framework follows in the next section.

S = South African Students, Standardised, Systemised

- ***South African Students -*** This framework is specifically designed for South African and African students in the FET phase, to raise academic standards and reach more students. It prescribes the CAPS (SA Curriculum and Assessment Policy Statements) as well as the IEB (International Examination Board) curriculum to prepare students for examinations at the end of Grade 12.

- ***Standardised (content and assessment) -*** The framework can be used by student supervisors (instructors) when developing mobile e-learning courses and content. Educational created content must conform to minimum quality standards for acceptance. All assessment should be standardised and automated as Multiple Choice Questions and answers.

- ***Systemised (monitoring, review and evaluation of education data)***- an online system can enable data-informed decision making by education leaders at national, subnational, school and individual level. A feedback/rating feature can enable the evaluation of teachers for quality of instruction. It can also improve and simplify the collection, storage and analysis of learner and educator data based on learning outcomes.

A= Alternative, Accessible, Affordable

- ***Alternative*** – M- and E-learning are alternative forms of learning. Quality e-learning and m-learning courses and can complement or be used as a substitute for traditional school attendance, depending on the preferences, needs and personal circumstances of the learner and his/her parents or guardians. It can provide a more protected and secure way of receiving education as the learner need not travel far distances to a dangerous or unsafe school location.

- ***Accessible*** - The accessibility element of this framework serves a double purpose. The framework itself should be freely accessible to policy-makers, expert teachers and public stakeholders for developing learning programmes, guiding e-learning and m-learning practice and decision-making.

  Simultaneously, the e-learning system (promoted by this framework) will make educational materials accessible to the learner via his/her mobile device or computer. Learning can take place at any location where a learner is situated (with sufficient internet access) and at any time (24/7).

- ***Affordable*** - Once learning programmes have been developed and become available via the e-learning/ m-learning system there will be a minimal subscription cost to the learner/user per subject.

F= Facilitation and Fast Feedback

- ***Facilitation*** – The framework facilitates e-learning and m-learning initiatives and activities. It assists educators in structuring learning programs to include all topics stipulated by the CAPS and IEB curriculum in effective formats (short video and audio clips with interactive assessment).

- ***Fast Feedback*** – Automated and instant memorandum. Learners will receive instant results on submitted MCQ (Multiple Choice Questionnaires). I believe this will be both motivational and correctional in effect.

E = Ethical, Easy to use and Effective

- ***Ethical*** - The framework is in accord with education law and policy in South Africa. As per Section 29(2) of the Constitution: The framework can aid the

state's intention of providing education which is equitable, practicable and helps to redress the results of past discriminatory laws and practices. Students will not be discriminated against on the basis of race and educational standards will be maintained on par with and better than those in public educational institutions as stipulated in Section 29(3) of the Constitution. This framework adheres to privacy privilege to protect confidential personal information of students and teachers.

- *Easy to use* – Due to its simplicity this framework is easy to use by curriculum and instructional design developers, policy makers, and educators. Traditional classroom problems (absent teachers, non-availability of textbooks, noisy surroundings and lack of group discipline, etc.) can be eliminated. Learning materials should be intuitive and simple to understand (not overly complex and cluttered). It must be presented in a user-friendly format for access via any type of mobile device. Please refer back to Mayer's (2009) principles of effective multimedia design on pages 63 and 64.

- *Effective*- This framework paves the way for effective and concise instructional design. It enables expert teachers to employ micro-content when developing learning programmes towards specified learning outcomes. Student attention span is thus catered for.

R = Rewards and Results

- *Rewards* – The automated feedback system must be programmed to give constructive, positive and motivating feedback and prompts with praise (Chen 2011). A "do for one" feature can also be incorporated into the subscription service. When a learner pays and subscribes for a specific subject, then a similar subscription package is donated free of charge to another learner who would otherwise not have been able to pay for such a service.

- *Results* – With repeated access and viewing of the online educative materials and repeated practicing of assessment activities, students will become more proficient in the subject materials and be able to apply concepts better, leading to improved overall academic results and performance. This will have positive benefits for schools, learners, their families and South Africa's education sector as a whole.

Limitations and further recommendations relating to this research study are given in the sections below.

6.6. LIMITATIONS

A limitation of this study is that the proposed framework has not been tested in the field. This will be necessary once the SAFER e-learning system with educational content has been created, to put theory to practice.

6.7. RECOMMENDATIONS

Recommendations based on the findings from this study will now be presented to the specific applicable state entity or stakeholder group. Specific recommendations are suggested for the Department of Basic Education, teachers and researchers for further research in this field.

6.7.1. Recommendations for the Department of Basic Education

It is recommended that the DBE adopts (implements) the SAFER framework and invests in the development, design and coding of an effective national e- and m-learning system for the FET phase that incorporates all the elements included in the SAFER framework. Additional recommendations for the DBE include the following:

- **To prescribe quality standards for e-learning content creation and curation**

To oversee, manage and curate content creation, the DBE must stipulate minimum quality standards for acceptable visual and sound quality, lesson and assessment pace, length and difficulty (micro-chunking implies that lessons are 6-10 minutes in duration), accessibility and ease of use. Mayer's (2009) multimedia principles (see Section 2.2.4.) should be incorporated into these quality stipulations. Stipulations regarding feedback to and from students (including timeliness, accuracy and completeness) must also be given.

- **To maintain an online database with lesson templates and teacher training videos**

This can form part of the e-learning system supported by the SAFER framework. An educational database with lesson templates, short learning videos and standardised assessment tasks for Mathematics, Accounting and Physical Science must be maintained and regularly updated. Assessment practice will initially only be presented as multiple choice questions with instant memorandum and feedback, but there is scope for further development later and possibly also expanding South Africa's vocational education streams.

The DBE's Thutong online portal must be redesigned for improved user-friendliness, easier navigation and simplified lay-out. Only high-quality, useful and relevant content should be accessible via this portal. A database with professional teacher training videos can be made available through this portal.

- **To remove/revise outdated education policy and drafting new mobile education policy**

Redundant education policy pre-dating the age of digitisation (such as the white papers discussed in this dissertation and the norms and standards for educators) should be removed or replaced with better phrased, more streamlined, practically implementable and effective policies. The UNESCO

mobile policy guidelines (Kraut 2013) can inform the drafting of mobile education policy for South Africa.

- **To provide better support and infrastructure for teachers in South Africa**

   As in Finland, teachers in South Africa should be highly specialised in their field (holding a Master's Degree or higher) and their professionalism promoted. In my opinion, teachers should also be better trained in pedagogics and learners' emotional and cognitive development. Tutor and assistant teachers should be appointed to facilitate teaching and learning in the classroom.

   Furthermore, it is recommended that teacher evaluation is conducted via a pre-designed MSQ mobile application with 'yes' and 'no' answers to ensure that learner feedback constructive.

- **To implement a legislated e-Rate**

   A legislated e-Rate must be implemented to make internet access more affordable to schools and libraries. This has been proposed in 2004, but is not a reality yet (ISPA 2017). Implementing and administering a legislated e-Rate is crucial to advance e-learning adoption and innovation in South Africa.

- **To found an Education Research Institute**

   This institute's mandate should be to drive education research and innovation in technology and digitisation. The SAFER e- and m-learning system can be used to collect, measure and present educational indicators and learner data (as statistics) timeously and accurately for analysis, by continuously and automatically tracking learner progress and activity. The data provided by this system can be used to inform education policy, budgeting and funding,

curriculum development and course design. The data can also be used to project future labour/skills forecasting shortages and needs in South Africa.

6.7.2. Recommendations for teachers

As mentioned above, a database with high quality training videos should be made available online for teachers' professional development and use according to their needs. The database with lesson templates will allow teachers to create and design lessons according to a pre-set, standardised structure and format that can be uploaded onto the SAFER e-learning system (provided that the created instructional materials comply with minimum quality standards).

The main purpose of the e-learning framework is to improve overall enrolment rates and raise national achievement and progress levels by providing content that is benchmarked internationally. It can improve educators' instructional and organisational skills, reduce low-quality teaching and amplify effective teaching methods and practices for improved learner and teacher results. It also serves to lighten the administrative burden placed on teachers as they no longer need to fulfil multiple roles simultaneously, but will instead be valued and respected as experts in their subject field

6.7.3. Recommendations for further research

- **Cognition**

It is worthwhile to do a more in-depth study of cognition, brain development and how learning physically happens in the brain, so that e- and m-learning content can be tailored to promote optimal brain functioning, memory formation, memory retention and recall in learners. Research on the human brain and cognitive neuroscience has been advancing rapidly in the USA, Canada and Europe. Neuroscientists at the University of Toronto have developed a technique to digitally reconstruct facial images perceived by test

participants based on electroencephalography (EEG) data (Campbell 2018). Other impressive initiatives include The Human Brain Project (2017), co-funded by the European Union and the Human Connectome Project (2017) in the United States. An article by Geddes (2016) includes an informative introductory video on the latest detailed brain map. Another successful endeavour is that of the BRAIN Initiative (2018) (Brain Research through Advancing Innovative Neuro-technologies Initiative). Kaku (2014) discusses many new technologies and processes used in brain research such as MRI (magnetic resonance imaging) , fMRI (functional magnetic resonance imaging), ECoG (electrocorticography), PET (positron emission tomography) and CAT (computerised axial tomography) in his book entitled: The Future of the Mind: The Scientific quest to Understand, Enhance and Empower the Mind. (View the official website: http://www.mkaku.org/ for many related articles and interesting videos about diverse topics).

- **A critical, evaluative analysis of e- and m-learning technologies and tools**

It is important to stay up to date on current developments and know which technological tools are most effective to facilitate learning. A critical, comparative and evaluative study can be conducted to ascertain which mobile applications and devices are best.

A latest device, for example is a headset (designed at MIT) that can detect a wearer's internal thoughts and speak back to the user (Gibbs 2018). Rao, Voyles & Ramchandani (2017) highlight ten top trends in Artificial Intelligence for 2018 including: Deep learning theory, Capsule networks, Automated Machine learning and Explainable AI, all relating to intelligent machine development, computer programming and machine learning.

6.8.   CONCLUSION

South Africa and Africa lag behind developed nations when it comes to successful e-learning and m-learning implementation. This thesis shows that international e-learning research conducted and still ongoing is indicative of not only development

and improvement, but also success. In my opinion, South Africa needn't 'reinvent the wheel' to suit its unique or particular needs. It is an exciting endeavour to plan the next step of designing an e-learning system and structure its educational content for digital delivery as supported by the SAFER framework and applicable underlying learning theory, which has been substantiated throughout this dissertation. This will advance e- and m-learning throughout the continent and contribute to the body of knowledge pertaining to the field of e- and m-learning.

BIBLIOGRAPHY

Acharya, S. & Shukla, S. 2012. Mirror neurons: Enigma of the metaphysical modular brain. *Journal of Natural Science, Biology and Medicine* Jul-Dec 3(2): 118-124 [Online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3510904/#ref23 [Accessed 30 Apr. 2018].

ACT (American College Testing) Website. 2018. [Online] Available at: https://www.act.org/content/act/en/about-act.html [Accessed 30 Apr. 2018].

Activity Theory. 2018. Learning theories. [Online] Available at: https://www.learning-theories.com/activity-theory.html [Accessed 01 Aug. 2018].

Adebowale, O. 2011. Online Injustice, Poverty and Fear. In G. Kurubacak, & T. Yuzer (Eds.), *Handbook of Research on Transformative Online Education and Liberation: Models for Social Equality* (pp. 312-329). Hershey, PA: IGI Global.

Adelzadeh, A. 2017. Modelling Future Demand and Supply of Skills in South Africa. Technical Report Ten Year Forecast. [Online] Available at: http://www.dhet.gov.za/Commissions%20Reports/Modelling%20future%20of%20demand%20and%20supply%20of%20skills%20in%20south%20Africa/Modelling%20future%20demand%20and%20supply%20of%20skills%20in%20South%20Africa.pdf [Accessed 4 May 2018].

Akamai Technologies Inc. 2017. akamai's [state of the internet] Q3 2016. Cambridge, Massachusetts. [online] Available at: https://www.akamai.com/us/en/our-thinking/state-of-the-internet-report/index.jsp [Accessed 16 Feb. 2017].

AllCountries vide All Countries.World 2017. South Africa's Geography. [Online] Available at: https://allcountries.world/south-africa/geography/ [Accessed 7 Aug. 2018].

Aluko, R. 2017. Applying UNESCO Guidelines on Mobile Learning in the South African Context: Creating an Enabling Environment through Policy. The International Review of Research in Open and Distributed Learning. [Online] Available at: http://www.irrodl.org/index.php/irrodl/article/view/2702 [Accessed 30 Apr. 2018].

Ambilympics Website.2018. [Online] Available at: http://www.euroskills2018.com/ [Accessed 4 May 2018].

Amrein-Beardsley, A. 2012. Recruiting expert teachers into high-needs schools: Leadership, money, and colleagues. *Education policy analysis archives* 20(27) [Online] Available from: https://epaa.asu.edu/ojs/article/view/941

Amendments to SA Schools Act vide Solidariteit. 2017. *Amendments to SA Schools Act don't prioritise quality education.* [Online] Available at: https://solidariteit.co.za/en/amendments-schools-act-dont-prioritise-quality-education/ [Accessed 8 Sep. 2018].

ANA vide Annual National Assessment webpage on ISASA website. 2018. [Online] Available at: https://www.isasa.org/annual-national-assessment/ [Accessed 6 May 2018].

Andersen, N. 2017. Read: High Court rules that schools can't promote one religion. *The South African*. [Online] Available at: https://www.thesouthafrican.com/read-high-court-rules-that-schools-cant-promote-one-religion/ [Accessed 14 Aug. 2017].

Anderson, J. & Wang, A.,X. 2016. In the world's biggest education test, one small country has raced past all the others. *Quartz.* [Online] Available at: https://qz.com/853656/massachusetts-ranks-nears-singapore-the-education-powerhouse-in-global-assessment-of-15-year-olds-who-are-the-best-students-in-the-world-according-to-pisa-2015/ [Accessed 7 Aug. 2018].

Anderson, T. & Dron, J. 2011. Three generations of distance education pedagogy. *The International Review Of Research In Open and Distributed Learning 12(3): 80-*

97 [Online] Available at: http://www.irrodl.org/index.php/irrodl/article/view/890/1663 [Accessed 12 Sep. 2018].

Asmal, K. 2001. Department of Education. *Education in South Africa: Achievements since 1994.* [online] Available at: https://www.dhet.gov.za/Reports%20Doc%20Library/Education%20in%20South%20Africa%20Achievements%20since%201994.pdf [Accessed 4 Apr. 2014].

Attewell, J., & Savill-Smith, C. 2004. Mobile learning and social inclusion: Focusing on learners and learning. In *Learning with mobile devices, research and development conference* (mLearn), Rome, 3–11.

Attendance Register Application *Virtual Maze.* Itunes App Store Preview. [Online] Available at: https://itunes.apple.com/za/app/attendance-register/id437438449?mt=8 [Accessed 30 Apr. 2018].

Attendance Tracker. *PeterMan Apps.* Google Play. [Online] Available at: https://play.google.com/store/apps/details?id=peterman.apps.attendance&hl=en [Accessed 30 Apr. 2018].

Aubusson, P., Schuck, S., & Burden, K. 2009. Mobile learning for teacher professional learning: Benefits, obstacles and issues. ALT-J Research in Learning and Teaching, 17(3): 233-247.

Babbie, E. 2010. *The Practice of Social Research.* Wadsworth, Belmont

Baker, B.D. & Cooper, B.S. 2005. Do Principals With Stronger Academic Backgrounds Hire Better Teachers? Policy Implications for Improving High-Poverty Schools. *Educational Administration Quarterly* 41(3):449-479. [Online] Available at: http://journals.sagepub.com/doi/abs/10.1177/0013161X04269609 [Accessed 30 Apr. 2018].

Bakhtin, M. 1981. *The dialogic imagination.* Transcribed by C. Emerson and M. Holquist. Austin, TX: University of Texas Press.

Babbel Website. 2018. [Online] Available at: https://lp.babbel.com/d/ENG_index.html?bsc=aw6b_engall&btp=default&gclid=EAIaI QobChMIxpf67_-s2QIVq7_tCh1yXgOKEAAYASAAEgL3FvD_BwE&l2=ALL [Accessed 12 Sep. 2018].

Baran, E. 2013. Connect, Participate and Learn: Transforming Pedagogies in Higher Education. *Bulletin of the IEEE Technical Committee on Learning Technology* 15(1): 9-12.

Barbosa, E. F. 2013. A requirements catalogue for mobile learning environments. In: *Proceedings of the 28th Annual ACM Symposium on Applied Computing*. Coimbra, Portugal, 18–22 March 2013. ACM, pp. 1266–1271.

Bates, T. 2007. Strategic Planning for E-Learning in a Polytechnic. In M. Bullen, & D. Janes (Eds.), *Making the Transition to E-Learning: Strategies and Issues* (pp. 47-65). Hershey, PA: IGI Global.

Bates T. 2010. New Challenges for Universities: Why They Must Change. In: Ehlers UD., Schneckenberg D. (eds) Changing Cultures in Higher Education. Springer, Berlin, Heidelberg

Bates, A.W. 2015. *Teaching in a Digital Age: Guidelines for Designing Teaching and Learning* Vancouver BC: Tony Bates Associates Ltd.

Battenfield, M. 2015. Why Every Student Succeeds Act Still Leaves Most Vulnerable Kids Behind. *The Conversation.* [Online] Available at: https://www.usnews.com/news/articles/2015-12-14/why-every-student-succeeds-act-still-leaves-most-vulnerable-kids-behind [Accessed 30 Apr. 2018].

BBC News. 2017. *Robot automation will 'take 800 million jobs by 2030' –report.* [online] Available at: http://www.bbc.com/news/world-us-canada-42170100 [Accessed 29 Nov. 2017].

BBC News. 2017. *What is net neutrality.* [Online] Available at: https://www.youtube.com/watch?v=zq-2Yk5OgKc [Accessed 2 May 2018].

Bell, F. 2011. Connectivism: Its Place in Theory- Informed Research and Innovation in Technology-Enabled Learning. *International Review of Research in Open and Distance Learning* 12(3): 98-118 [Online] Available at: http://www.irrodl.org/index.php/irrodl/article/view/902/1827 [Accessed 18 Mar. 2018].

Berkeley Graduate Division. Graduate Student Instructor Teaching and Resource Center. *Cognitive Constructivism.* [Online] Available at: http://gsi.berkeley.edu/gsi-guide-contents/learning-theory-research/cognitive-constructivism/#background [Accessed 16 Jan. 2018].

Berkowitz, B. & Clark, P. 2014. The health hazards of sitting. *The Washington Post.* [Online] Available at: https://www.washingtonpost.com/apps/g/page/national/the-health-hazards-of-sitting/750/ [Accessed 20 Mar. 2018].

Berleur, J. 2011. Ethical and Social Issues of the Internet Governance Regulations. In D. Haftor, & A. Mirijamdotter (Eds.), *Information and Communication Technologies, Society and Human Beings: Theory and Framework (Festschrift in honor of Gunilla Bradley)* (pp. 466-476). Hershey, PA: IGI Global.

Bezuidenhout, RM., Davis, C., Du Plooy-Cilliers, F. 2014. *Research Matters.* Claremont, Juta and Company.

Blaauwberg Online. *South African Government School Terms/Holiday Calendars for 2018-2019.* [Online] Available at: http://www.blaauwberg.net/schools_holidays_terms_south_africa_african.php [Accessed 4 May 2018].

Blewett, C. 2018. Why putting the words 'learning' and 'Facebook' together isn't an oxymoron. [Online] Available at: https://theconversation.com/why-putting-the-words-learning-and-facebook-together-isnt-an-oxymoron-90552 [Accessed 5 Feb. 2018].

Bloomberg, M.R. 2018. A Seven-Step Plan for Ending the Opioid Crisis. *Bloomberg View* [Online] Available at: https://www.bloomberg.com/view/articles/2018-01-10/a-seven-step-plan-for-ending-the-opioid-crisis [Accessed 30 Apr. 2018].

Blumenfield, W. J. 2011. Abuse of human-computer interactions: a counterpoint to transformative and liberatory technologies. In G. Kurubacak, & T. Yuzer (Eds.), *Handbook of Research on Transformative Online Education and Liberation: Models for Social Equality* (pp. 292-311). Hershey, PA: IGI Global.

Bonk, C.J & Zhang, K. 2006. Introducing the R2D2 Model: Online learning for the diverse learners of this world. *Distance Education.* 27(2): 249-264.

Bowen, G.A. 2009. Document analysis as a qualitative research method. *Qualitative Research Journal 9*(2): 27-40.

Boyes et al. 2005. Using the SECTIONS Framework to Evaluate Flash Media. *Innovate: Journal of Online Education.* 2(1) Article 2 [online] Available at: http://nsuworks.nova.edu/innovate/vol2/iss1/2 [Accessed: 2 Sep. 2017].

Bozurt, A., Akgün-Özbek, E. & Zawacki-Richter, O. 2017. *Trends and Patterns in Massive Open Online Courses: Review and Content Analysis of Research on MOOCs (2008-2015).* International Review of Research in Open and Distributed Learning. 18(5). [Online] Available at: http://www.irrodl.org/index.php/irrodl/article/view/3080/4268 [Accessed 20 Mar. 2018].

BRAIN Initiative Website. 2018. *The BRAIN Initiative Mission.* [Online] Available at: *http://www.braininitiative.org/mission/* [Accessed 2 May 2018].

Brand, J., Kinash, S., Mathew, T., & Kordyban, R. 2011. *iWant does not equal iWill : Correlates with iPads, textbooks, Blackboard Mobile Learn and a blended learning experience.* Proceedings ascilite 2011 Hobart Tasmania Australia, 4-11 December 2011. pp 168 – 178.

Bratt, M. 2017. US ditches net neutrality, South Africa remains committed to it. [Online] Available at: http://themediaonline.co.za/2017/12/us-ditches-net-neutrality-south-africa-remains-committed-to-it/ [Accessed 2 May 2018].

Brill, J.M., & Park, Y. 2008. Facilitating Engaged Learning in the Interaction Age Taking a Pedagogically-Disciplined Approach to Innovation with Emergent Technologies. *International Journal of Teaching and Learning in Higher Education* 20(1):70-78

Brooker, A, Lawrence, J and Dodds, A. 2017. Using Digital Concept Maps to Distinguish Between Young Refugees' Challenges. Journal of Interactive Media in Education, 2017(1): 4, pp. 1–11, DOI: https://doi.org/10.5334/jime.433

Bruck, P.A., Motiwalla, L., Foerster, F. 2012. Mobile Learning with micro-content: A Framework and Evaluation. *25th BLED eConference. AIS electronic library.* 527-543

Bruk, D. 2015. 13 Signs You Have a Serious Case of FOBO. *Seventeen.* [Online] Available at: https://www.seventeen.com/life/a26367/signs-you-have-fobo/ [17 Feb. 2018].

Bryman, A. 2012.*Social science research.*4th ed. New York: Oxford University Press.

Budget of the U.S. Government. 2019. *An American Budget pp 39-44.* [Online] Available at: https://www.whitehouse.gov/wp-content/uploads/2018/02/budget-fy2019.pdf [Accessed 30 Apr. 2018].

Bulger, M., Mayer, R. E., & Almeroth, K. C. 2006. Engaged by design: Using simulations to promote active learning. Paper presented at the World Conference on Educational Multimedia, Hypermedia and Telecommunications (EDMEDIA), Chesapeake, VA.

Burton, J. K., Moore, D. M., & Magliaro, S. G. 2004. Behaviorism and instructional technology. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology*. New York: Simon & Schuster.

Burton, D. & Bartlett, S. 2009. 'Research Paradigms and Social Perspectives', in Key Issues for Education Researchers. SAGE Publications Ltd, London

Bušíková, A., Melicheríková,Z. 2013. Ethics in E-learning. International Association for Development of the Information Society (IADIS) International Conference on e-Learning (Prague, Czech Republic, Jul 23-26, 2013)

BusinessTech. 2018. New schooling option expected to shake up South Africn education system. [Online] Available at: https://businesstech.co.za/news/lifestyle/243239/new-schooling-option-expected-to-shake-up-south-african-education-system/ [Accessed 11 Sep. 2018].

BusinessTech. 2017. South Africa's broadband speed vs the world. [Online] Available at: https://businesstech.co.za/news/broadband/190888/south-africas-broadband-speeds-vs-the-world/ [Accessed 1 Aug. 2018].

Busuu Website. 2018. [Online] Available at: https://www.busuu.com/en/mobile [Accessed 12 Sep. 2018].

Bwalya, K. J., Du Plessis, T., & Rensleigh, C. (2013). Multi-Dimensional Factors Impacting on E-Government Adoption in Botswana, Mozambique, and Malawi. In S. Sharma (Ed.), *Adoption of Virtual Technologies for Business, Educational, and Governmental Advancements* (pp. 58-71). Hershey, PA: IGI Global.

Campbell, D. 2018. New technique developed at U of T uses EEG to show how our brains perceive faces. [Online] Available at: https://www.utoronto.ca/news/new-technique-developed-u-t-uses-eeg-show-how-our-brains-perceive-faces [Accessed 2 May 2018].

Carmack,C.2012. Six Core Prinicples of IDEA. [Online] Available at: https://www.youtube.com/watch?v=P--IJkVYItQ [Accessed 30 Apr. 2018].

Castells, M. (2000) T*he Rise of the Network Society* Oxford: Blackwell

CC vide Common Core State Standards Initiative Website. 2018. [Online] Available at: http://www.corestandards.org/ [Accessed 30 Apr. 2018].

CC vide Common Core Standards Video. 2018. [Online] Available at: https://vimeo.com/116379560 [Accessed 30 Apr. 2018]

Chang, C.K. 2010a. Acceptability of an asynchronous learning forum on mobile devices. *Behaviour and Information Technology, 29*(1), 2333.

Chang, J. 2010b. Hermeneutic Inquiry: A research approach for post-modern therapists. *Journal of Systemic Therapies 29(1): 19–32*

Chen, I. 2011. Behaviorism and Developments in Instructional Design and Technology. In I. Management Association (Ed.), *Instructional Design: Concepts, Methodologies, Tools and Applications* pp. 1259-1281. Hershey, PA: IGI Global.

Chen, I. 2011. Instructional Design Methodologies. In I. Management Association (Ed.), *Instructional Design: Concepts, Methodologies, Tools and Applications* (pp. 80-94). Hershey, PA: IGI Global.

Chen, Y.S., Kao, T.C.,Yu, G.J.,& Sheu, J.P. 2004. *A mobile butterfly-watching learning system for supporting independent learning.* Paper presented at the 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education, JungLi,Taiwan.

Chen, Y.S., Kao, T.C., & Sheu, J.P. 2003. A mobile learning system for scaffolding bird watching learning. *Journal of Computer Assisted Learning, 19*, 347359.

Children's Online Privacy Protection Rule (CORPA) 16 CFR Part 312. 2018. [Online] Available at: https://www.ftc.gov/enforcement/rules/rulemaking-regulatory-reform-proceedings/childrens-online-privacy-protection-rule [Accessed 2 May 2018].

Children's Internet Protection Act.2017. [Online] Available at: https://www.fcc.gov/consumers/guides/childrens-internet-protection-act [Accessed 2 May 2018].

Clark, R. C. & Mayer, R.E. 2016. *e-learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning.* Fourth Edition. [Online] Available at: https://onlinelibrary.wiley.com/doi/book/10.1002/9781119239086 [Accessed 11 Sep. 2018].

CNN Make Create Innovate. 2015. *Nanobots could be small solutions to big problems.* [Online] Available at: https://edition.cnn.com/videos/tv/2015/01/29/spc-make-create-innovate-nanobots.cnn [Accessed 15 Feb. 2018].

Collins, R. 1981. Some comparative principles of educational stratification, in: Dale, R. et al., Education and the State, Falmer Press pp 277-292

Corbin, J. & Strauss, A. 2008. *Basics of qualitative research: Techniques and procedures for developing grounded theory (3rd ed.).* Thousand Oaks, CA: Sage.

Cornell, R. 2002. Bridging Continents: Technology Trends Today and Tomorrow. *Educational Media International*, 39(1): 3.

Cowan, N. 2001. The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *Behavioral and Brain Sciences*, 24(1): 87-114.

Cronje, J.C. 2008. *High School eLearning: An investigation into the desirable and workable features of an internet eLearning resource to sustain high school learning communities.* Doctor Philosophiae dissertation, University of Pretoria, South Africa

Cronje, J.C. 2006 *Who killed e-learning?* Cape Peninsula University of Technology, Cape Town, South Africa [online] Available at: http://asianvu.com/digital-library/elearning/Whokillede-learning.pdf [Accessed 15 Feb. 2018].

Crowe, A. R. 2007. Learning to teach with mobile technology: A teacher educator's journey. In M. van't Hooft & K. Swan (Eds.), *Ubiquitous computing in education* (pp. 127144). Mahwah, New Jersey: Lawrence Erlbaum Associates.

CSIR. 2018. *CSIR Meraka Institute Webpage.* [Online] Available at: https://www.csir.co.za/csir-meraka-institute [Accessed 30 Apr. 2018].

Daly,P. 2006. The Pedagogical Challenges Facing Franch Business Schools in the implementation of E-learning Initiatives *International Journal of Teaching and Learning in Higher Education.* 18(2):89-96

Dainton, M. & Zelley, E.D. 2011. Applying Communication Theory for Professional Life, A Practical Introduction (2nd edition). SAGE Publications, Inc.

DBE (Department of Basic Education) Webstie. 2018. *CAPS for Further Education and Training Phase* [Online] Available at: https://www.education.gov.za/Curriculum/CurriculumAssessmentPolicyStatements(CAPS)/CAPSFET.aspx [Accessed 11 Sep. 2018].

DBE (Department of Basic Education) Website. 2017a. *Master List of Schools.* [Online] Available at: https://www.education.gov.za/Programmes/EMIS/EMISDownloads.aspx [Accessed 2 May 2018].

DBE (Department of Basic Education). 2017b. *National Senior Certificate Diagnostic Report Part 1.* [Online] Available at: https://www.education.gov.za/Portals/0/Documents/Reports/2017%20NSC%20Diagnostic%20Report%20Part%201.pdf?ver=2018-01-30-140924-883 [Accessed 2 May 2018].

DBE (Department of Basic Education). 2017c. NSC Examinations webpage. [Online] Available at: https://www.education.gov.za/Curriculum/NationalSeniorCertificate(NSC)Examinations/tabid/338/Default.aspx [Accessed 20 Feb. 2018].

DBE (Department of Basic Education). 2017d. *Memorandum on the objects of the Basic Education Laws Amendment Bill 2015.* [Online] Available at: https://www.gov.za/sites/default/files/41178_gon1101.pdf [Accessed 10 Mar. 2018].

DBE (Department of Basic Education). 2016. *Education Statistics in South Africa 2014.* Pretoria: Department of Basic Education. [online] Available at: http://www.education.gov.za/Portals/0/Documents/Publications/Education%20Statistics%202014.pdf?ver=2016-05-13-144159-067 [Accessed 13 Jan. 2017].

DBE (Department of Basic Education). 2016. *National Assessment Circular No. 3 of 2016. Special Condonation Dispensation for learners in the senior phase (grades 7-9).* Pretoria: Department of Basic Education [online] Available at: http://www.education.gov.za/Portals/0/Documents/Publications/Circular%20A3%20of%202016.pdf?ver=2016-12-07-154005-723 [Accessed 5 Jun. 2017].

DBE (Department of Basic Education). 2015. *Action Plan to 2019 Towards the Realisation of Schooling 2030.* [Online] Available at: https://www.education.gov.za/Portals/0/Documents/Publications/Action%20Plan%202019.pdf?ver [Accessed 5 Sep. 2018].

DBE (Department of Basic Education). 2014. *Draft National Policy for the Provision and Management of Learning and Teaching Support Material (LTSM) September 2014.* Pretoria: Department of Basic Education. [Online] Available at:http://www.education.gov.za/LinkClick.aspx?fileticket=MnCEAX7Qrac%3D&tabid=390&mid=1125 [Accessed 17 Jan. 2017].

DBE (Department of Basic Education). 2014. *Policy for the Provision of Distance Education in South African Universities in the context of an integrated post-school system 2014.* Pretoria: Department of Basic Education. [online] Available at: http://www.education.gov.za/LinkClick.aspx?fileticket=MnCEAX7Qrac%3D&tabid=390&mid=1125 [Accessed 17 Jan. 2017].

DBE (Department of Basic Education). 2007. *The Framework for the National Strategy for Learner Attainment (NSLA).* Pretoria: Department of Basic Education.

[Online] Available at: www.eranet.co.za/zenex/files/460_NSLA.doc [Accessed 16 Jan. 2017].

DBE (Department of Basic Education). 2004. *Notice 1922 of 2004 White Paper on e-Education Transforming Learning and Teaching through Information and Communication Technologies (ICTs).* Pretoria: Department of Basic Education. [Online] Available at: https://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/DoE%20White%20Paper%207.pdf?ver=2008-03-05-111708-000 [Accessed 11 Sep. 2018].

DBE (Department of Basic Education). 2002. *Policy Revised National Curriculum Statement Grades R-9 (Schools) Overview.* Pretoria: Department of Basic Education. [Online] Available at: http://www.education.gov.za/Portals/0/CD/GET/doc/overview.pdf?ver=2006-11-21-100143-000 [Accessed 13 Jan. 2017]

DBE (Department of Basic Education). 2001. *Education White Paper 6 Special Needs Education Building an Inclusive Education and Training System.* Pretoria*:* Department of Basic Education. [online] Available at: http://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/Education%20%20White%20Paper%206.pdf?ver=2008-03-05-104651-000 [Accessed 15 Jan. 2017].

DBE (Department of Basic Education). 2000. *Goverment Notice 82*. *National Education Policy Act 1996 Norms and Standards for Educators* Pretoria*:* Department of Basic Education. [Online] Available at: http://www.gov.za/sites/www.gov.za/files/20844.pdf [Accessed 15 Jan. 2017].

DBE (Department of Basic Education). 1998. *Education White Paper 4 Notice 2188 of 1998. A Programme for the Transformation of Further Education and Training* Pretoria*:* Department of Basic Education. [Online] Available at:http://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/NO

TICE%202188%20OF%201998.pdf?ver=2008-03-05-110931-000 [Accessed 14 Jan. 2017].

DBE (Department of Basic Education). 1997. *Quality Education for All Overcoming barriers to learning and development. Report of the National Commission on Special Needs in Education and Training (NCSNET).* Pretoria*:* Department of Basic Education. [Online] Available at: http://www.education.gov.za/Portals/0/DoE%20Branches/GET/Inclusive%20Education/Overcoming%20barriers%20to%20learning%20and%20development.pdf?ver=2008-03-05-104546-000 [Accessed 18 Jan. 2017].

DBE (Department of Basic Education). 1996. *Education White Paper 2 1996 The Organisation, Governance and Funding of Schools Notice 130 OF 1996* Pretoria*:* Department of Basic Education. [Online] Available at: http://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/white%20paper%202.pdf?ver=2008-03-05-111655-000 [Accessed 14 Jan. 2017].

DBE (Department of Basic Education). 1995. *Education White Paper 1 Education and Training Notice 196 of 1995* Cape Town*:* Department of Basic Education. [Online] Available at: http://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/White%20paper%20on%20Education%20and%20Training%201995.pdf?ver=2008-03-05-111656-000 [Accessed 13 Jan. 2017].

Dennen, V. and Hao, S. 2014. Intentionally mobile pedagogy: the M-COPE framework for mobile learning in higher education. Technology, Pedagogy and Education, 23(3): 397-419.

Denmans Epp, C. 2017. Migrants and Mobile Technology Use: Gaps in the Support Provided by Current Tools. Journal of Interactive Media in Education, 2017(1): 2, pp. 1–13, DOI: https://doi.org/10.5334/jime.432

DeStefano, J. 2013. Teacher Training and Deployment in Malawi. In Akiba, M. (Eds), Teacher Reforms Around The World: Implementations And Outcomes, Bingley, U.K.:

Emerald Group Publishing Limited, eBook Collection (EBSCOhost) EBSCOhost, viewed 6 May 2018

Devault, G. 2018. Establishing Trustworhtiness of Data in Qualitative Research. What Are Qualitative Research Procsses? The balance small business [Online] Available at: https://www.thebalancesmb.com/establishing-trustworthiness-in-qualitative-research-2297042 [Accessed 01 Aug. 2018].

De Villiers, R. 2017. South Africa must do more to keep teachers from seeking 'greener pastures'. Mail & Guardian. [Online] Available at: https://mg.co.za/article/2017-11-16-south-africa-must-do-more-to-keep-teachers-from-seeking-greener-pastures [Accessed on 15 Feb. 2018].

De Villiers, J. Pijoos, I. & Nyoka, N. 2018. 10 arrested for Hoërskool Overvaal protest. News24. [Online] Available at: https://www.news24.com/SouthAfrica/News/10-arrested-for-hoerskool-overvaal-protest-20180117 [Accessed 29 Apr. 2018].

De Vos, A.S., Strydom, H., Fouché and Delport, C.S.L. 2011. Research at grass roots for the social sciences and human service professions. Pretoria: Van Schaik

DeVos,B. 2018. Prepared Remarks by U.S. Education Secretary Betsy DeVos to the American Enterprise Institute. U.S. Department od Education. [Online] Available at: https://www.ed.gov/news/speeches/prepared-remarks-us-education-secretary-betsy-devos-american-enterprise-institute [Accessed 30 Apr. 2018].

Downes, S. 2007. What connectivism is Half An Hour, February 3

Downes, S. 2012. Connectivism and Connective Knowledge: Essays on meaning and learning networks. National Research Council Canada. [Online] Available at: https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/Connective_Knowledge-19May2012.pdf [Accessed on 15 Jun. 2017].

Downes, S. 2014. The MOOC of One. INTED, Valencia, Spain, March 10

Downey, M. 2018. Betsy DeVos: Common Core is dead at U.S. Department of Education. The Atlanta Journal-Constitution. [Online] Available at: https://www.myajc.com/blog/get-schooled/betsy-devos-common-core-dead-department-education/cQzYu1G8fauL6KPp41aVgJ/ [Accessed 30 Apr. 2018].

Dube, G.A. 2017. A Review of Educational Policies that Affect Funding of School Libraries in Malawi. School Libraries Worldwide 23 (1):84-94

Duckworth, A.L. 2013. Grit: The power of passion and perseverance. [Online] Available at: https://www.ted.com/talks/angela_lee_duckworth_grit_the_power_of_passion_and_perseverance [Accessed 10 Jan. 2018].

Duke, B., Harper, G., Johnston, M. 2013. Connectivism as a Digital Age Learning Theory. The International HETL Review Special Issue: 5-6, [Online] Available at: https://www.hetl.org/wp-content/uploads/2013/09/HETLReview2013SpecialIssueArticle1.pdf. [Accessed 15 Jun. 2017].

Duolingo Website.2018. Learn a language for free. Forever. [Online] Available at: https://www.duolingo.com/ [Accessed 28 Apr. 2018].

Du Toit, C. 2017 EXPLAINER: Deadline looms for input on draft education bill. eNCA. [Online] Available at: https://www.enca.com/south-africa/explainer-deadline-looms-for-input-on-draft-education-bill[Accessed on 15 Dec. 2017].

Dweck, C. 2014. The power of believing that you can improve. [Online] Available at: https://www.ted.com/talks/carol_dweck_the_power_of_believing_that_you_can_improve [Accessed 10 Jan. 2018].

Dweck, C. 2006. Mindset: Changing the way you thin to fulfil your potential. New York: Ballatine Books, Penguin Random House

Ed NCES Video.2017. *What is the Condition of Education?* [Online] Available at: https://www.youtube.com/watch?v=Ql_t8X6kxjA [Accessed 2 May 2018].

ED (United States Department of Education) website. 2018. [Online] Available at: https://www.ed.gov/ [Accessed 30 Apr. 2018].

EDU.fi website. 2018. [Online] Available at: http://www.edu.fi/etusivu [Accessed 4 May 2018]

OECD (Organisation for Economic Co-operation and Development).2018*. Education & Skills Online Assessment.* OECD Website. [Online] Available at: http://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/ [Accessed 4 May 2018]

EDUFI (Finnish National Agency for Education). 2018a. *Education in Finland.* [Online] Available at: http://www.oph.fi/download/175015_education_in_Finland.pdf [Accessed 4 May 2018]

EDUFI (Finnish National Agency for Education). Website. 2018b. *Basic Education.* [Online] Available at: http://www.oph.fi/english/education_system/basic_education [Accessed 4 May 2018]

EDUFI (Finnish National Agency for Education). Website. 2018c. *Finnish National Agency for Education.* [Online] Available at: https://www.oph.fi/english/about_us [Accessed 12 Sep. 2018].

EDUFI (Finnish National Agency for Education). Website. 2018d. *Upper secondary education and training.* [Online] Available at: http://www.oph.fi/english/education_system/upper_secondary_education_and_training [Accessed 4 May 2018]

EDUFI (Finnish National Agency for Education). Website. 2018e. *Vocational Upper Secondary Education.* [Online] Available at:

http://www.oph.fi/english/curricula_and_qualifications/vocational_upper_secondary_education [Accessed 4 May 2018]

EDUFI (Finnish National Agency for Education). 2017. Finnish National Agency for Education Organisation 2017. [Online] Available at: https://www.oph.fi/download/181391_organisation_chart.pdf [Accessed 4 May 2018].

Eisner, E. W. 1991. *The enlightened eye: Qualitative inquiry and the enhancement of educational practice.* New York, NY: Macmillan Publishing Company.

eNCA. 2017. *EXPLAINER: Deadline looms for input on draft education bill.* [Online] Available at: https://www.enca.com/south-africa/explainer-deadline-looms-for-input-on-draft-education-bill [Accessed 8 Sep. 2018].

Engelbrecht, E. 2003. A look at e-learning models: investigating their value for developing an e-learning strategy. Progressio 25(2):38-47

Engeström, Y., Miettinen, R. & Punamäki, R-L. 1999. Perspectives on Activity Theory. Cambrige, United Kingdom: Cambridge University Press.

Entman, R. 1993. *Framing: Toward clarification of a fragmented paradigm.*

ERIC vide Institute of Education Sciences Education Resources Information Center Website. [Online] Available at: https://eric.ed.gov/ [Accessed 30 Apr. 2018].

European Union-General Data Protection Regulation Website. 2018. [Online] Available at: https://www.eugdpr.org/ [Accessed 20 Apr. 2018].

European Commission. 2012. Rethinking Education: Investing in skills for better socio-economic outcomes. *Communication from the commission to the European parliament, the council, the European Economic and Social Committee and the Committee of the Regions* [Online] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0669&from=EN [Accessed 4 May 2018].

Euroskills Website.2018. [Online] Available at: http://www.euroskills2018.com/ [Accessed 4 May 2018]

Eurydice (European Commission). 2017. *Eurydice. National Education Systems.* [Online] Available at: https://eacea.ec.europa.eu/national-policies/eurydice/home_en [Accessed 4 May 2018].

FAQ vide Common Core Standards Frequently Asked Questions. 2018. [Online] Available at: http://www.corestandards.org/wp-content/uploads/FAQs.pdf [Accessed 30 Apr. 2018].

Farnsworth,R. 2017. Is Australia or the United States bigger in geographical size?. *Quora.* [Online] Available at: https://www.quora.com/Is-Australia-or-the-United-states-bigger-in-geographical-size [Accessed 7 Aug. 2018].

Fass, R. A. 1990. Cheating and plagiarism. *Ethics and Higher Education.* May, W. W. editor. New York: Macmillan Publishing Company and American Council on Education.

Fataar, A. & Kruger, E. 2017. Decolonising education in South Africa: An interview with Aslam Fataar. *Litnet University Seminar.* 23 January [online] Available at: http://www.litnet.co.za/decolonising-education-south-africa-interview-aslam-fataar/ [Accessed 7 Aug. 2018].

FCC (Federal Communications Commission). 2018*. E-rate: Universal Service Program for School and Libraries.* [Online] Available at: https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate [Accessed 20 Apr. 2018].

Figlio, D.N. 2003. Fiscal Implications of School Accountability Initiatives In Tax Policy and the Economy Volume 17. *National Bureau of Economic Research* [Online] Available at: http://www.nber.org/chapters/c11533.pdf [Accessed 12 Sep. 2018].

Finnish Basic Education Act 628/1998. [Online] Available at: http://www.finlex.fi/en/laki/kaannokset/1998/en19980628.pdf [Accessed 4 May 2018].

Finnish Upper Secondary Schools Act 629/1998. *Finlex Website.* [Online] Available at: http://www.finlex.fi/fi/laki/ajantasa/1998/19980629 [Accessed 4 May 2018].

Flick, U, Scott, W, & Metzler, K 2014, *The SAGE Handbook Of Qualitative Data Analysis*, London, [England]: SAGE Publications Ltd, eBook Collection (EBSCOhost), EBSCO*host*, viewed 17 August 2017.

FNBE. (Finnish National Board of Education). *Teachers in Finland – trusted professionals.* [Online] Available at: http://www.oph.fi/download/148962_Teachers_in_Finland.pdf [Accessed 4 May 2018].

FNBE. (Finnish National Board of Education). 2015. *National Core Curriculum for General Upper Secondary Schools 2015.* [Online] Available at: https://www.ellibs.com/fi/book/9789521362675/national-core-curriculum-for-general-upper-secondary-schools-2015 [Accessed 4 May 2018].

FNBE. (Finnish National Board of Education). 2014. *National Core Curriculum for Basic Education 2014.* [Online] Available at: https://www.ellibs.com/fi/book/9789521362590/national-core-curriculum-for-basic-education-2014 [Accessed 4 May 2018].

FNBE. (Finnish National Board of Education). 2013. *Quality assurance in education: steering instead of control.* [Online] Available at: http://www.oph.fi/download/148966_Quality_assurance_in_general_education.pdf [Accessed 4 May 2018].

FNBE. (Finnish National Board of Education). 2012. *Education, Training and Demand for Labour in Finland by 2025.* [Online] Available at: http://www.oph.fi/download/144754_Education_training_and_demand_for_labour_in_Finland_by_2025_2.pdf [Accessed 4 May 2018].

FNBE and MoCE. 2015. *Finnish VET in a Nutshell.* 2015. In "VET in Finland" series. Published by : Ministry of Education and Culture, Finish National Board of Education & CIMO. [Online] Available at: http://www.oph.fi/download/165770_finnish_vet_in_a_nutshell.pdf [Accessed 4 May 2018].

Freebody, P.R. 2003a. 'Analysing educational texts', in *Qualitative research in education*, Introducing Qualitative Methods, SAGE Publications Ltd, pp. 174-208. , [Accessed 17 Aug. 2017].

Freebody, P.R. 2003b. 'Exploring the neighbourhood in search of the 'qualitative'', in *Qualitative research in education*, Introducing Qualitative Methods, SAGE Publications Ltd, pp. 34-54. , [Accessed 17 Aug. 2018].

Fuller, E.J., Hollingwoth, L. & Pendola, A. 2017. The Every Student Succeeds Act, State Efforts to Improve Access to Effective Educators, and the importance of School Leadership. *Educational Administration Quarterly* 53(5): 727-756 [Online] Available at: http://journals.sagepub.com/doi/abs/10.1177/0013161X17711481 [Accessed 30 Apr. 2018].

Gagné, R.M. 1996. The Conditions of Learning. 3rd Edition. Holt, Rinehart and Winston 1977

Gagné, R., Briggs, L., & Wager, W. 1974. *Principles of instructional design.* Fort Worth, TX: HBJ College Publishers.

Garrison, R. 2000. Theoretical Challenges for Distance Education in the 21st Century: A shift from structural to transactional issues. *The International Review of Research in Open and Distributed Learning,* 1(1)

Gaved, M and Peasgood, A. 2017. Fitting in Versus Learning: A Challenge for Migrants Learning Languages Using Smartphones. Journal of Interactive Media in Education, 2017(1): 1, pp. 1–13

Gearhart, D. 2001 Ethics in Distance Education: Developing Ethical Policies. *Online Journal of Distance Learning Administration.* 4(1):1-3

Geddes, L. 2016. Human brain mapped in unprecedented detail. *Nature International weekly journal of science.* [Online] Available at: https://www.nature.com/news/human-brain-mapped-in-unprecedented-detail-1.20285 [Accessed 2 May 2018].

Gedye, L. 2016. Paperless classroom hasn't taken off yet. *Mail & Gaurdian* [Online] Available at: https://mg.co.za/article/2016-05-27-00-paperless-classroom-hasnt-taken-off-yet [Accessed 10 Aug. 2017].

GHS. *General Household Survey 2015 Focus on Schooling Report.* Department of Basic Education South Africa. Pretoria. [Online] Available at: https://www.education.gov.za/Portals/0/Documents/Reports/2015%20GHS%20Report.pdf?ver=2017-07-03-102540-673 [Accessed 13 Mar. 2018].

GHS vide South Africa (Republic). Statistics SA. 2016. *General Household Survey 2015.* Pretoria. [Online] Available at: https://www.statssa.gov.za/publications/P0318/P03182015.pdf [Accessed 18 Feb. 2017].

Gibbs, S. 2018. Researchers develop device that can 'hear' your internal voice. *The Guardian.* [Online] Available at: https://www.theguardian.com/technology/2018/apr/06/researchers-develop-device-that-can-hear-your-internal-voice [Accessed 30 Apr. 2018].

Gibson, W.J. & Brown, A. 2009. *Working with qualitative data*, SAGE Publications Ltd, London, [Accessed 17 Aug. 2017].

Gilbert, J. 2005. *Catching the Knowledge Wave: the Knowledge Society and the Future of Education.* Wellington, NZ: New Zealand Council for Educational Research

Given, LM 2008, *The SAGE encyclopedia of qualitative research methods*, SAGE Publications, Inc., Thousand Oaks, CA, [Accessed 27 Jul. 2017].

Goba, N. 2018. WATCH : Parent punched in EFF scuffle at Hoërskool Overvaal. *Sowetan LIVE*. [Online] Available at: https://www.sowetanlive.co.za/news/south-africa/2018-01-17-watch-parent-punched-in-eff-scuffle-at-horskool-overvaal/ [Accessed 29 Apr. 2018].

Good, T. L., & Brophy, J. E. (1990). *Educational psychology: A realistic approach* (4th ed.). White Plains, NY: Longman.

Goodwin, L. D., & Goodwin, W. L. 1984. Are validity and reliability "relevant" in qualitative evaluation research? *Evaluation & the Health Professions* 7: 413-426.

Google Expeditions. 2018. Google Expeditions website. [Online] Available at: https://edu.google.com/expeditions/#about [Accessed 24 Apr. 2018].

Google For Education. 2016. Teacher Status in Finland. [Online] Available at: https://static.googleusercontent.com/media/edu.google.com/en//pdfs/google-for-education-teacher-status-in-finland-final-report-november-2016.pdf [Accessed 7Jul. 2018].

Gorsky, P. & Caspi, A. 2005. A critical Analysis of Transactional Distance Theory. *The Quarterly Review of Distance Education* 6(1): 1-11 Information Age Publishing, Inc.

Gosper, M. et al. 2007. Selecting ICT based solutions for quality learning and sustainable practice. Australasian Journal of Educational Technology. 23(2): 227-247.

Govender, P. 2016. School dropout numbers blamed on poor learning in early grades. *Mail & Gaurdian*, 6 June: 1. [online] Available at: http://mg.co.za/article/2016-06-06-school-dropout-numbers-blamed-on-poor-learning-in-early-grades [Accessed 12 Feb. 2017].

Government of Malawi. 2014. Education Sector Implementation Plan II (2013-2018). [Online] Available at: http://www.education.gov.mw/phocadownload/ESIP-II%20LATEST%20DOC.pdf [Accessed 7 Aug. 2018].

Government of Malawi. 2013a. Education Act No. 21 of 2013. [Online] Available at: http://www.education.gov.mw/phocadownload/Education%20Act%20%202013.pdf [Accessed 7 Aug. 2018].

Government of Malawi. 2013b. National ICT Policy. [Online] Available at: http://www.macra.org.mw/wp-content/uploads/2014/07/Malawi-ICT-Policy-2013.pdf [Accessed 7 Aug. 2018].

Grant, C. & Osanloo, A. 2014. *Understanding, Selecting, and integrating a theoretical framework in dissertation research: creating the blueprint for your "house".* Administrative Issues Journal: Connecting Education, Practice, And Research 4(2):12-26. [Online] Available at: https://files.eric.ed.gov/fulltext/EJ1058505.pdf [Accessed 19 Jul. 2017].

Gray, P. 2018. The Joy and Sorrow of Rereading Holt's "How Children Learn" Blog On The Mission. [Online] Available at: https://medium.com/the-mission/the-joy-and-sorrow-of-rereading-holts-how-children-learn-ffb4f46485e9 [Accessed 8 Feb. 2018].

Guo, J. P., Pang, M. F., Yang, L. Y., & Ding, Y. (2012). Learning from comparing multiple examples: On the dilemma of "similar" or "different." *Educational Psychology Review*, *24*(2), 251–269.

Haber, J 2014. *Moocs*. Cambridge, Massachusetts: The MIT Press, eBook Collection (EBSCOhost), EBSCO*host*, viewed 4 Aug. 2018.

Hall,M. 2013. Perry's Scheme – Understanding the Intellectual Development of College-Age Students. *The Innovative Instructor Blog John Hopkins University* [Online] Available at: https://ii.library.jhu.edu/2013/12/13/perrys-scheme-understanding-the-intellectual-development-of-college-age-students/ [Accessed 11 Sep. 2018].

Hamann, R. 2018. Developing Countries need to wake up to the risks of new technologies. *The Conversation.* [Online] Available at: https://theconversation.com/developing-countries-need-to-wake-up-to-the-risks-of-new-technologies-87213 [Accessed 1 Feb. 2018].

Hammersley, M, & Traianou, A 2012, *Ethics In Qualitative Research: Controversies And Contexts*, Los Angeles [i.e. Thousand Oaks, Calif.]: SAGE Publications Ltd, eBook Collection (EBSCOhost), EBSCO*host*, viewed 8 August 2017

Harari, Yuval, M. 2016. *Homo Deus: A Brief History of Tomorrow.* London: Penguin Random house, UK

Hardach, S. 2018. *How you talk to your child changes their brain.* World Economic Forum Neuroscience [Online] Available at: https://www.weforum.org/agenda/2018/02/how-you-talk-to-your-child-changes-their-brain [Accessed 8 Apr. 2018].

Harris, J., Pryor J. & Adams, S. 2006. The Challenge of Intercoder Agreement in Qualitative Inquiry. [Online] Available at: https://www.researchgate.net/publication/228490436_The_challenge_of_intercoder_agreement_in_qualitative_inquiry?enrichId=rgreq-2aaa5f6564df07f6e350e2fb3910adea-XXX&enrichSource=Y292ZXJQYWdlOzIyODQ5MDQzNjtBUzoxMDQwOTcxMzA3NDU4NTZAMTQwMTgzMDA5ODEwMg%3D%3D&el=1_x_3&_esc=publicationCoverPdf [Accessed 24 Apr. 2018].

Hastedt, D. 2016. *Introduction to TIMSS & PIRLS.* [Online] Available at: https://www.youtube.com/watch?v=k4PliVwW69Y [Accessed 4 May 2018].

Hemsley-Brown, J & Sharp, C. 2003. The use of research to improve professional practice: a systematic review of the literature. *Oxford Review of Education* 29(4).

Higgs, P., Van Niekerk, L.J., & Van Wyk, B. 2010. The role of community in curriculum development for ODL in an African context. Progressio, 32(2), 134-144.

High Court, vide The High Court Says Public Schools Cannot Promote One Religion Over Others. 2017. *Huffington Post SA.* [Online] Available at: https://www.huffingtonpost.co.za/2017/06/28/the-high-court-says-schools-cannot-promote-one-religion-over-oth_a_23005646/ [Accessed 15 Jan. 2018].

Hill, S. 2018. What's the difference between 4G and LTE? *Digital Trends.* [Online] Available at: https://www.digitaltrends.com/mobile/4g-vs-lte/ [Accessed 1 Aug. 2018].

Hofer, B. and Pintrich, P. 1997. 'The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning' *Review of Educational Research,* 67(1): 88-140

Holt, J. C. 1967. How Children Learn. Pitman Publishing Corporation: USA
Hsu, Y-C & Ching, Y-H. 2015. A review of models and frameworks for designing Mobile Learning Experiences and Environments. *Canadian Journal of Learning and Technology.* 41(3): 2-22

Huang, K-Y. 2009. Challenges in human-computer interaction design for mobile devices. In: Proceedings of the World Congress on Engineering and Computer Science 2009. San Francisco, USA, 20–22 October 2009. Hong Kong: International Association of Engineers, pp. 20–22.

Human Brain Project. 2017. *Explore the Brain* [Online] Available at: https://www.humanbrainproject.eu/en/explore-the-brain/ [Accessed 2 May 2018].

Human Connectome Project. 2017. *USC University of Southern California.* [Online] Available at: http://www.humanconnectomeproject.org/ [Accessed 2 May 2018].

ICT roll out vide, Progress made in ICT roll out in Gauteng schools.2016. *SANews,* 22 August :1. [online] Available at: http://www.sanews.gov.za/south-africa/progress-made-ict-roll-out-gauteng-schools [Accessed 14 Jun. 2017].

IDEA Webpage. 2019. Individuals with Disabilities Act. [Online] Available at: https://sites.ed.gov/idea/?src=ft [Accessed 30 Apr. 2018].

IEB Assessment Matters. 2015. *Prycision.* [Online] Available at: http://www.ieb.co.za/ [Accessed 14 Feb. 2018].

Immordino-Yang, M.& Damasio, A. 2007. We Feel, Therefore We Learn: The Relevance of Affective and Social Neuroscience to Education. Mind, Brain, and Education, 1(1): 3-10.

Institute of Education Sciences You Tube Channel. 2018. [Online] Available at: https://www.youtube.com/channel/UCRUCjPehBxFQ6lfZDqq_f7g [Accessed 30 Apr. 2018].

Institute of Education Sciences Website. 2018. [Online] Available at: https://ies.ed.gov/ [Accessed 30 Apr. 2018].

Institute of Education Sciences Video. 2016. *Introduction to the Institute of Education Sciences.* [Online] Available at: https://www.youtube.com/watch?v=l-aBA0GklOQ [Accessed Apr. 2018].

Instructional Design Central 2018. Instructional Design Definitions [Online] Available at: https://www.instructionaldesigncentral.com/whatisinstructionaldesign [Accessed 01 Aug. 2018].

ISPA Internet Service Providers' Association Website. 2017. *Press release: ISPA: There is No Implementable E-Rate.* [Online] Available at: https://ispa.org.za/press_releases/ispa-there-is-no-implimentable-e-rate/ [Accessed 12 Sep. 2018].

Jalil, A, Beer, M and Crowther, P 2015 Pedagogical Requirements for Mobile Learning: A Review on MOBIlearn Task Model. Journal of Interactive Media in Education, 2015(1): 12, pp. 1–17, DOI: http://dx.doi.org/10.5334/jime.ap

Jeffreys, M., Troy, K., Slawik, N., & Lightfoot, E. 2007. *Issues in bridging the divide between policymakers and researchers.* Minneapolis: University of Minnesota

Jenkins, J. 2015. The New Three R's of Education: Resourcefulness, Responsibility, and Respect. Edutopia. [Online] Available at: https://www.edutopia.org/discussion/new-three-rs-education-resourcefulness-responsibility-and-respect [Accessed: 8 Jun. 2017].

Jenkins,J. 2006. *Constructivism* in Eds English, F.W. Encyclopedia of Educational Leadership and Administration. SAGE Publications A Thousands Oaks [Accessed: 8 Jun. 2017].

Jezard, A. 2017. Is this Finnish school the perfect design? World Economic Forum Website [Online] Available at: http://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/ [Accessed 4 May 2018].

Jika, T. 2017. Exposed: Explosive Gupta e-mails at the heart of state capture. *Sunday Times News,* 28 May: 1. [online] Available at: http://www.timeslive.co.za/sundaytimes/stnews/2017/05/28/Exposed-Explosive-Gupta-e-mails-at-the-heart-of-state-capture [Accessed 5 Jun. 2017].

Jin, Q. 2012. Intelligent Learning Systems and Advancements in Computer-Aided Instruction: Emerging Studies (pp. 1-378). Hershey, PA: IGI Global.

Jonassen, D.H, & Rohrer Murphy, L. 1999. Activity Theory as Framework for designing Constructivist Learning Environments. *Educational Technology Research & Development Journal.* 47(1): 61-79

Jones C. 2015. Theories of Learning in a Digital Age. In: Networked Learning. Research in Networked Learning. Springer, Cham

Kaku, M. 2018. Official Website of Dr Michio Kaku. [Online] Available at : http://www.mkaku.org/ [Accessed 30 Apr. 2018].

Kaku, M . 2014. The Future of the Mind. Penguin. Kindle book Kamuzu Academy Website. 2018. [Online] Available at: http://www.kamuzuacademy.com/index-2.html [Accessed 4 May 2018].

Karboul, A. 2017. *The global learning crisis – and what to do about it.* [Online] Available at: https://www.ted.com/talks/amel_karboul_the_global_learning_crisis_and_what_to_do_about_it. [Accessed 12 Jan. 2018].

Karpov, Y. 2014. *Vygotsky for Educators.* Cambridge: Cambridge University Press

Kasemsap, K. 2015. Theory of Cognitive Constructivism. In M. Al-Suqri, & A. Al-Aufi (Eds.), *Information Seeking Behavior and Technology Adoption: Theories and Trends* (pp. 1-25). Hershey, PA: IGI Global.

Kayode, D.J, Alabi, A.T., Sofoluwe, A.O. & Oduwaiye, R.O. 2015. Implementation of Mobile Teaching and Learning in University Education in Nigeria: Issues and Challenges. In Zhang, Y. (ed) *Handbook of Mobile Teaching and Learning.* Springer, Verlag Berlin Heidelberg

Khan, B.H. 2001. *A framework for web-based learning.* Englewood Cliffs, New Jersey: Education Technology Publications Inc.

Khan, B.H. 2004. People, process and product continuum in e-learning: The e-learning P3 model. Educational Technology, 44(5): 33-40.

Khan, B.H. 2005. E-learning quick checklists. London, United Kingdom: Information Science Publishing.

Khan, S. 2011. Let's use video to reinvent education. [Online] Available at: https://www.ted.com/talks/salman_khan_let_s_use_video_to_reinvent_education [Accessed 12 Jan. 2018].

Khan, S. 2015 Let's teach for mastery not test scores [Online] Available at: https://www.ted.com/talks/sal_khan_let_s_teach_for_mastery_not_test_scores [Accessed 12 Jan. 2018].

Kincheloe, J. L., & McLaren, P. 2002. Rethinking critical theory and qualitative research. In Y. Zou & E. T. Trueba (Eds.), *Ethnography and schools: Qualitative approaches to the study of education* (pp. 87–138). Lanham, MD: Rowman & Littlefield.

Kim, K. & Bonk, C.J. 2006 'The future of online teaching and learning in higher education: the survey says...' *Educase Quarterly,* (4): 22-29

Kirk, J., & Miller, M. L. 1986. Reliability and validity in qualitative research. Beverly Hills, CA: SAGE Publications.

Klein, A. 2016. The Every Student Succeeds Act: An ESSA Overview. *Education Week.* [Online] Available at: https://www.edweek.org/ew/issues/every-student-succeeds-act/index.html [Accessed 30 Apr. 2018].

Klein, 2015. No Child Left Behind: An Overview. *Education Week.* [Online] Available at: https://www.edweek.org/ew/section/multimedia/no-child-left-behind-overview-definition-summary.html [Accessed 1 May 2018].

Kögler, H-H. 2008. Critical Hermeneutics. In L.M. Given (Eds). *The SAGE Encyclopedia of Qualitative Research Methods.* SAGE Publications Inc : Thousand Oaks (pp 152-155)

Kolagani, S. 2016 Synchronous and Asychonous Learning: Benefits and Limitations. *Commlab India Global Learning Solutions ELearning Design.* [Online] Available at: https://blog.commlabindia.com/elearning-design/synchronous-and-asynchronous-learning [Accessed 01 Aug. 2018].

Koller, D. 2012. *What we're learning from online education.* [Online] Available at: https://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education [Accessed 12 Feb. 2018].

Kondowe, B. 2015. Passing Malawi's Revised Education Act. *Global Campaign for Education United States.* [Online] Available at:

http://campaignforeducationusa.org/blog/detail/passing-malawis-revised-education-act [Accessed 30 Apr. 2018].

Kop, R. 2011. The challenges to connectivist learning on open online networks: Learning experiences during a massive open online course. *The International Review Of Research In Open And Distributed Learning 12(3):19-38* [Online] Available at: http://www.irrodl.org/index.php/irrodl/article/view/882/1823 [Accessed 11 Sep. 2018].

Korea (Republic). 2015. *Education 2030 Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4.* Incheon.

Kovachev, D., Cao, Y., Klamma, R. & Jarke, M. 2011. Learn-as-you-go: New Ways of Cloud-Based Micro-Learning for the Mobile Web, In H.Leung, et.al, (Eds), ICWL 201, Springer-Verlag, Berlin, LNCS 7048, pp. 51-61.

Kraut, R. 2013. *Policy Guidelines for Mobile Learning.* UNESCO: France [Online] Available at: http://unesdoc.unesco.org/images/0021/002196/219641e.pdf [Accessed 23 Apr. 2018].

Kuchi, T., Gardner, R. and Tipton,R. 2003. A Learning Framework for Information Literacy and Library Instruction programs at Rutgers University Libraries. Rutgers University Libraries [Online] Available at: http://www.rci.rutgers.edu/~kuchi/files/Recommendations%20of%20the%20Learning%20framework%20Study%20Group.pdf [Accessed: 10 Feb. 2017].

Kurt, Ö. E. & Şimşek, I.E. 2016. Evaluation of Mobile Learning with the Eight-Dimensional E-learning framework. *In: Khan, B.H (ed): Revolutionizing Modern Education through Meaningful E-Learning Implementation (pp.80-108)* Hershey, PA: IGI Global.

Kuuti, K. 1995. Activity theory as a potential framework for human-computer interaction research. *In: Nardi (ed.): Context and Consciousness: Activity Theory and Human Computer Interaction, Cambridge: MIT Press, (pp. 17-44.)*

Land, G. 2011. *The Failure of Success.* [Online] Available at: https://www.youtube.com/watch?v=ZfKMq-rYtnc [Accessed 15 Jan. 2018].

Land, G. & Jarman, B. 1993. Breakpoint and Beyond : Mastering the Future Today. HarperBusiness.

Leaf, C. 2018. Mirror Neurons: Why we feel each other's emotions. [Online] Available at: https://drleaf.com/blog/mirror-neurons-why-we-feel-each-others-emotions/ [Accessed 30 Apr. 2018].

Leene, A. 2006. MicroContent is Everywhere (On Microlearning) In Microlearning Conference 2006, ed. M. L. Theo Hug, Peter A. Bruck, 20 - 31. Innsbruck: Innsbruck university press.

Letaba, P. 2017. South African performance on the trends in international mathematics and science study. *The National Advisory Council on Innovation.* [Online] Available at: http://www.naci.org.za/index.php/south-african-performance-on-the-trends-in-international-mathematics-and-science-study/ [Accessed 4 May 2018].

Liaw, S-S, Hatala, M & Huang, H-M. 2010. Investigating acceptance toward mobile learning to assist individual knowledge management: Based on activity theory approach. Computers & Education, 54, pp. 446–454.

Liberty Concepts. 2015. Scaffolding Definition. *The Glossary of Education Reform,* 4 Jun 2015: 1. [online] Available at: http://edglossary.org/scaffolding/ [Accessed 13 Feb. 2017].

Lincoln, Y.S. & Guba, E.A. 1985. *Naturalistic inquiry.* Beverly Hills, CA:SAGE
Littlejohn, S.W. & Foss, K.A. 2008. *Theories of Human Communication (International Student Edition).* Cengage Learning

Lombard, M. 2010. Intercoder Reliability. [Online] Available at: http://matthewlombard.com/reliability/ [Accessed 29 Apr. 2018].

Lyotard,J-J. 1984. *The Post-Modern Condition: A Report on Knowledge* Manchester: Manchester University Press

Lysaght, Z. 2011. Epistemological and paradigmatic ecumenism in "Pasteur's Quadrant:" Tales from doctoral research. Official Conference Proceedings of the Third Asian Conference on Education in Osaka, Japan.

Mabuza, E. 2017. Mixed reaction to court's ruling against single-religion schools. *TimesLIVE.* [Online] Available at: https://www.timeslive.co.za/news/south-africa/2017-06-28-mixed-reaction-to-courts-ruling-against-single-religion-schools/ [Accessed 10 Jan. 2018].

Maneschijn, M.M. 2005. *The E-Learning Dome: A Comprehensive E-Learning Environment Development Model.* M.Sc. dissertation, University of Pretoria, South Africa

Malamed, C. 2017. Is Microlearning The Solution You Need? A Close Look at Bite-sized Learing. *The e-Learning Coach.* [online] Available at: http://theelearningcoach.com/elearning2-0/what-is-microlearning/ [Accessed 5 Jun. 2017].

Markle, S. (1969). *Good frames and bad* (2nd ed.). New York: Wiley.

Mashaba, S. 2016. Paperless Classrooms expand in Gauteng. *The Sowetan.* [Online] Available at: http://www.sowetanlive.co.za/news/2016/01/17/paperless-classrooms-expand-in-gauteng [Accessed 10 Aug. 2017].

Mathison, S 2005, *Encyclopedia of evaluation*, Sage Publications, Inc., Thousand Oaks, CA, [Accessed 27 Jul. 2017].

Matshe, G. 2013. *Ubuntu – a person is a person through other persons.* [Online] Available at: https://www.youtube.com/watch?v=BzIyOtusDxE [Accessed 9 Sep. 2018].

Mayer, R. E. 2009. Multimedia learning (2nd ed). New York: Cambridge University Press.

Mayring P. 2015. Qualitative Content Analysis: Theoretical Background and Procedures. In: Bikner-Ahsbahs A., Knipping C., Presmeg N. (eds*) Approaches to Qualitative Research in Mathematics Education. Advances in Mathematics Education*. Springer, Dordrecht

Maxwell, K. 2007. BuzzWord: blended learning. *Macmillan Dictionary, 16 April*: 1. [online] Available at: http://www.macmillandictionary.com/buzzword/entries/blended-learning.html [Accessed 5 Jun. 2017].

Mcleod, D. 2017. SA government still keen on net neutrality rules. *Tech Central.* [Online] Available at: https://techcentral.co.za/sa-government-still-keen-net-neutrality-rules/78679/ [Accessed 2 May 2018].

McLoughlin, C. and Lee, M.J.W. 2008. 'The Three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity'. *International Journal of Teaching and Learning in Higher Education,* 20(1): 10-20.

McMillan, J. H. and Schumacher, S. 2010. Research in Education: Evidence-based Inquiry. 7th edition, Pearson: New Jersey.

Memrise Website. 2018. *Unlock your learning superpowers with Memrise* [Online] Available at: https://www.memrise.com/ [Accessed 12 Sep. 2018].

Mergel, B. 1998. *Instructional design & learning theory.* University of Saskatchewan. [Online] Available at: https://etad.usask.ca/802papers/mergel/brenda.htm [Accessed 20 Apr. 2018].

Meriläinen M. & Piispanen M. 2015. Live, Laugh and Love to Learn Turning Learning from Traditional to Transformational. In: Isaías P., Spector J., Ifenthaler D., Sampson D. (eds) *E-Learning Systems, Environments and Approaches*. Springer, Cham

Merrill et al. 1966. Reclaiming Instructional Design. *Educational Technology* 36(5):5-7.

Mills, G., Obasanjo, O., Davis, D. & Herbst, J. 2017. *Making Africa Work A handbook for success.* First Edition. Cape Town: Tafelberg.

Milne, A. J. 2007. Entering the interaction age: Implementing a future vision for campus learning spaces...today. *EDUCAUSE Review, 42*(1)*,* 12-31.

Mishra, S., Ed. 2009. *E-Learning IGNOU (STRIDE handbook 8).* New Delhi, India.

MoEC (Ministry of Education and Culture) (Finland). 2016. New comprehensive School Action Plan. [Online] Available at: http://minedu.fi/documents/1410845/4183002/New+Comprehensive+School+Action+Plan+2016 [Accessed 4 May 2018].

MoEC (Ministry of Education and Culture) (Finland) Website. 2018. *Ministry of Education and Culture.* [Online] Available at: http://minedu.fi/en/areas-of-expertise [Accessed 4 May 2018].

MoEST (Ministry of Education, Science and Technology) (Malawi). 2015. National Education Standards Primary and Secondary Education. [Online] Available at: http://www.education.gov.mw/phocadownload/NATIONAL%20EDUCATION%20STANDARS.pdf [Accessed 7 Aug. 2018].

MoEST (Government of Malawi Ministry of Education, Science and Technology) Website. 2018. [Online] Available at: http://www.education.gov.mw/ [Accessed 4 May 2018]

MoGCD (Government of Malawi Ministry of Gender, Children and Community Development) Webpage. 2018. [Online] Available at: http://www.malawi.gov.mw/index.php?option=com_content&view=article&id=27&Itemid=111 [Accessed 4 May 2018].

MoL (Government of Malawi Ministry of Labour) Webpage. 2018. [Online] Available at:

http://www.malawi.gov.mw/index.php?option=com_content&view=article&id=72&Itemid=19 [Accessed 4 May 2018].

Moore, M.G. 1973. Towards a theory of independent learning and teaching. Journal of Higher Education, 44(9): 661-679.

Moore, M.G. 1983. The individual adult learner. In M. Tight (Ed.), Adult learning and education (pp. 153–168). London: Croom Helm

Moore, M.G. 1993. Theory of transactional distance. In D. Keegan, (Ed.), *Theoretical principles of distance education.* New York: Routledge.

Moore, M.G. 2013. The theory of transactional distance. In M. G. Moore (Ed.) *Handbook of distance education* (3rd ed., pp. 66-85). New York, NY: Routledge.

Motau, K. 2017. MEC Lesufi given R40 billion to improve GP Education. *Eyewitness News* [Online] Available at: https://ewn.co.za/2017/06/25/lesufi-given-r40-billion-turn-improve-gp-education [Accessed 11 Sep. 2018].

Motau, K. 2017. Lesufi to Expand Paperless Platform to all township high schools by 2019. *Eyewitness News* [Online] Available at: https://ewn.co.za/2017/06/26/lesufi-to-expand-paperless-platform-to-all-townships-high-schools-by-2019 [Accessed 11 Sep. 2018].

Motiwalla, L.F. 2007. Mobile learning: A framework and evaluation. *Computers & Education* 49: 581-596

Mukhari, S.S. 2016. *Teachers' experience of Information and Communication Technology use for Teaching and Learning in Urban Schools*. Doctorate thesis, UNISA, Pretoria.

Muller, S. 2016. Pressured South African schools had no choice but to relax maths pass mark. *The Conversation*, 3 December: 1. [online] Available at: http://theconversation.com/pressured-south-african-schools-had-no-choice-but-to-relax-maths-pass-mark-70289 [Accessed 18 Feb. 2017].

Mullis, I.V.S., Martin, M.O. 2018. *TIMSS 2019 Assessment Frameworks.* IEA TIMSS & PRILS International Study Center Lynch School of Education, Boston College. [Online] Available at: http://timss2019.org/wp-content/uploads/frameworks/T19-Assessment-Frameworks.pdf [Accessed 4 May 2018].

Mullis, I.V.S., Martin, M.O. 2015. *PIRLS 2016 Assessment Framework 2nd Edition.*

Muneja, M.S. 2015. *Secondary School Teachers' Implementation of the Competency-based Curriculum in the Arusha region, Tanzania*. M.Ed. dissertation, UNISA, Pretoria.

My Attendance Tracker. 2018. *MyAT MyAttendanceTracker.com* [Online] Available at: https://www.myattendancetracker.com/ [Accessed 30 Apr. 2018].

Mzekandaba, S. 2016. Gauteng gets more tech into classrooms.*ITWeb,* 14 July :1 [online] Available at: http://www.itweb.co.za/index.php?option=com_content&view=article&id=154257 [Accessed 16 June].

NADEOSA National Association of Distance Education and Open Learning in South Africa. 2017. *About Us.* [Online] Available at: http://www.nadeosa.org.za/ [Accessed 12 June].

NAEP (National Assessment of Educational Progress) Webpage. 2018a. *About NAEP A Common Measure of Student Achievement.* [Online] Available at: https://nces.ed.gov/nationsreportcard/about/ [Accessed 12 Sep. 2018].

NAEP (National Assessment of Educational Progress). 2018b. Assessment Frameworks. [Online] Available at :

https://nces.ed.gov/nationsreportcard/assessments/frameworks.aspx [Accessed 2 May 2018].

NAEP (National Assessment of Educational Progress) Webpage. 2018c. *Digitally Based Assessments.* [Online] Available at: https://nces.ed.gov/nationsreportcard/dba/ [Accessed 4 May 2018].

NAEP (National Assessment of Educational Progress). 2017a. *An Introduction to NAEP.* [Online] Available at: https://nces.ed.gov/nationsreportcard/pdf/parents/2010468.pdf [Accessed 12 Sep. 2018].

NAEP (National Assessment of Educational Progress) Video. 2017b. *Experience an Assessment.* [Online] Available at: https://nces.ed.gov/nationsreportcard/experience/ [Accessed 4 May 2018].

NAEP (National Assessment of Educational Progress) Video. 2017c. *Going Digital: NAEP Assessment for the Future.* [Online] Available at: https://www.youtube.com/watch?time_continue=3&v=-RJ4k0I6h2c [Accessed 4 May 2018].

NAEP (National Assessment of Educational Progress) Tutorials Webpage. 2017d. [Online] Available at: https://enaep-public.naepims.org/2018/Tutorial_Intro_Webpage/index.html [4 May 2018].

NAEP (National Assessment of Educational Progress) Website. 2017e. *The Nations Report Card* [Online] Available at: https://nces.ed.gov/nationsreportcard/about/ [Accessed 30 Apr. 2018].

NAEP (National Assessment of Educational Progress) Webpage. 2017f. *What Does the NAEP Economics Assessment Measure?* [Online] Available at: https://nces.ed.gov/nationsreportcard/economics/whatmeasure.aspx [Accessed 4 May 2018].

NAEP (National Assessment of Educational Progress) Website. 2017g. *What Does the NAEP Mathematics Assessment Measure?* [Online] Available at: https://nces.ed.gov/nationsreportcard/mathematics/whatmeasure.aspx [Accessed 4 May 2018].

NAEP (National Assessment of Educational Progress) Website. 2017h. *What Does the NAEP Science Assessment Measure?* [Online] Available at: https://nces.ed.gov/nationsreportcard/science/whatmeasure.aspx [Accessed 4 May 2018].

NAEP: The Nations Report Card. You Tube Channel. 2018. [Online] Available at: https://www.youtube.com/user/TheNationsReportCard [2 May 2018].

NAEP (National Assessment of Educational Progress) Video. 2012. *Introducing NAEP to Teachers.* [Online] Available at: https://www.youtube.com/watch?v=zR1_pUdSlFg [2 May 2018].

Naiman, L. 2014. Can Creativity be Taught? Results from Research Studies National Research Council of Malawi. 2002. Science and Technology Policy. [Online] Available at: http://www.education.gov.mw/phocadownload/science%20and%20technology%20policy%202002.pdf [Accessed 7 Apr. 2018].

Nations Encyclopedia 2018. Malawi-Location, size, and extent. [Online] Available at: http://www.nationsencyclopedia.com/Africa/Malawi-LOCATION-SIZE-AND-EXTENT.html [Accessed 7 Aug. 2018].

National Treasury (Republic of South Africa). 2018. *Budget Review 2018.* [Online] Available at: http://www.treasury.gov.za/documents/national%20budget/2018/review/FullBR.pdf [Accessed 5 Sep. 2018].

NCEE (National Center for Education Evaluation and Regional Assistance). 2017. *NCEE Brochure.* [Online] Available at: https://ies.ed.gov/ncee/pdf/ncee_brochure.pdf [Accessed 30 Apr. 2018].

NCER (National Center for Education Research) Website. 2018 *.* [Online] Available at: https://ies.ed.gov/ncer/ [Accessed 30 Apr. 2018].

NCES (National Center for Education Statistics) Website. 2018. [Online] Available at: https://www.youtube.com/user/EdNCES/videos [Accessed 30 Apr. 2018].

NCES (National Center for Education Statistics) You Tube Channel. [Online] Available at: https://ies.ed.gov/ncer/ [Accessed 30 Apr. 2018].

NCSER (National Center for Special Education Research) Website. 2018. [Online] Available at: https://ies.ed.gov/ncser/ [Accessed 12 Sep. 2018].

NDP (National Development Plan). 2030. 2012. *Our Future – Make it work, Executive Summary.* [Online] Available at: https://www.gov.za/issues/national-development-plan-2030 [Accessed 15 Feb. 2017].

NLE vide Institute of Education Sciences. National Library of Education Website. [Online] Available at: https://ies.ed.gov/ncee/projects/nle/ [Accessed 30 Apr. 2018].

Nestel, D, Ng, A, Gray, K, Hill, R, Villanueva, E, Kotsanas, G, Oaten, A and Browne, C 2010 Evaluation of mobile learning: Students' experiences in a new rural-based medical school. BMC medical education, 10(1): 57. DOI: http://dx.doi.org/10.1186/1472- 6920-10-57C

Nursey-Bray, Melissa. 2015. Moving with mobiles - using IT in the classroom as against online: Comparative reflection from South Australia. 741-751. 10.1007/978-3-642-54146-9_66. Y.A. Zhang (ed.), Handbook of Mobile Teaching and Learning.

Nordin, Norazah, Mohamed Amin Embi, and Melor Yunus. 2010. Mobile learning framework for lifelong learning. In International conference on learner diversity 2010.

Procedia – Social and Behavioral Sciences, 130–138. http://www.sciencedi466rect.com/science/article/pii/S1877042810020239

Norvig, P. 2012. *The 100 000-student classroom.* [online] Available at: https://www.ted.com/talks/peter_norvig_the_100_000_student_classroom [Accessed 10 Jan 2018].

Nyamundundu-Majarawanda, A. V. 2015. The Role of Leaders in Training and Development in Malawi: A Case Study of Private and Public Institutions in Malawi. In O. Modise (Ed.), *Cases on Leadership in Adult Education* (pp. 248-262). Hershey, PA: IGI Global

Oliver, E.2015. *Alternative Assessment for Effective Open Distance Education.* M.Ed. dissertation, University of South Africa, Pretoria

Ornstein, A.C., 2011. Philosophy as a Basis for Curriculum Decisions. In A.C. Ornstein, E.F. Pajak & S.B. Ornstein (Eds.), *Contemporary Issues in Curriculum,* 5th Edition (pp.1-9). Boston: Pearson

Osborne, S. 2017. South Africa outlaws single-religion schools. *The Independent.* [Online] Available at: http://www.independent.co.uk/news/world/africa/south-africa-single-religion-schools-outlaw-ban-faith-christian-muslim-jewish-a7814231.html [Accessed 14 Aug. 2017].

Oxford Paperback Dictionary, Thesaurus, and Wordpower Guide. 1st edition. 2001. Sv "framework" and "model". Oxford: Oxford University Press

Palalas, A. 2011. ESP for Busy College Students: Is the Blend of In-Class, Online & Mobile Learning the Answer? *The IALLT Journal of Language Learning Technologies.* 41(1):108-136

Park, Y. 2011. A Pedagogical Framework for Mobile Learning: Categorizing Educational Applications of Mobile Technologies into Four Types. *The International Review of Research in Open and Distributed Learning.* 12(2):1-12

Patel, S. 2015. *The research paradigm – methodology, epistemology and ontology – explained in simple language.* Blog [Online] Available at: http://salmapatel.co.uk/academia/the-research-paradigm-methodology-epistemology-and-ontology-explained-in-simple-language [Accessed 24 Apr. 2018].

Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods* (2nd ed.). Newbury Park, CA: Sage Publications, Inc.

Payne, G & Payne, J 2004, 'Reflexivity', in *Key concepts in social research*, SAGE Key Concepts, SAGE Publications, Ltd, London, pp. 191-195

Pendola, A. & Fuller, E. 2017. A Cycle of Inequity: Why Access to Quality Teachers Requires Access to Quality Principals. *American Journal of Education Forum* [Online] Available at: http://www.ajeforum.com/a-cycle-of-ineqity-why-access-to-quality-teachers-requires-access-to-quality-principals-by-andrew-pendola-and-edward-fuller/ [Accessed 30 Apr. 2018].

Penney, T. 2016. *ADDIE Model in Safety Training, how does yours measure up!* [online] Available at: https://www.linkedin.com/pulse/addie-model-safety-training-how-does-yours-measure-up-terry-penney [Accessed 30 Apr. 2018].

Peris-Oritz, M., Garrigós-Simon, F.J., Pechuàn. 2014. *Innovation and Teaching Technologies.* Switzerland: Springer International Publishing

Peters, O. 2004. The educational paradigm shifts. In O. Peters (Ed.), *Distance education in transition - new trends and challenges* (4th ed., pp. 25-35). Oldenburg: BIS.

Pilling-Cormick, J. 1996. *Development of the self-directed learning perception scale.* Unpublished doctoral dissertation, University of Toronto: Toronto, Canada.

Pilling-Cormick, J. 2011. *SRL/SDL and Technology-Enhanced Learning: Linking Learner Control with Technology*. In G. Dettori, & D. Persico (Eds.), *Fostering Self-Regulated Learning through ICT* (pp. 396-412). Hershey, PA: IGI Global.

Pintrich, P. R. 2000. *The role of goal orientation in self-regulated learning*. In Boekaerts, M., Pintrich, P. R., & Zeidner, M. (Eds.), Handbook of self-regulation (pp. 451–502). San Diego, CA: Academic Press.

PIRLS International Achievement Video. 2018. [Online] Available at: https://www.youtube.com/watch?time_continue=24&v=qoXaHaeOgPk [Accessed 4 May 2018].

Preissle, J. 2008. Ethics. In L.M. Given (Ed). *The SAGE Encyclopedia of Qualitative Research Methods*. SAGE Publications, Inc: Thousand Oaks (pp 274-277)

Prensky, M. 2001. Digital natives, digital immigrants. Part 2: Do they really think differently? *On the Horizon 9*(6)*:*1-6.

Ramanand, R. 2013.*Towards a Proposed Framework for an E-learning System.* M.Sc. dissertation, University of South Africa, Pretoria

Rao, A., Voyles, J. & Ramchandani, P. 2017. Top 10 artificial intelligence (AI) technology trends for 2018. *PWC Next in Tech blog*. [Online] Available at: http://usblogs.pwc.com/emerging-technology/top-10-ai-tech-trends-for-2018/ [Accessed 30 Apr. 2018].

Rapley, T 2007a. *Doing conversation, discourse and document analysis*, Qualitative research kit, SAGE Publications Ltd, London, [Accessed 27 Jul. 2017].

Rapley, T. 2007b. Generating an archive. In *Qualitative Research kit: Doing conversation, discourse and document analysis* (pp. 9-22): SAGE Publications Ltd

Readers Are Leaders. 2016. *Readers are leaders website.* Wordpress.[Online] Available at: http://readersareleaders.co.za/ [Accessed 18 Mar. 2018].

Redelinghuys, F. 2017. *100 000 say no to amendment bill on Basic Education Act.* [Online] Available at: http://www.politicsweb.co.za/politics/100-000-say-no-to-amendment-bill-on-basic-educatio [Accessed 9 Sep. 2018].

REL vide Institute of Education Sciences Regional. Educational Laboratory Program (REL) Website. [Online] Available at: https://ies.ed.gov/ncee/edlabs/ [Accessed 30 Apr. 2018].

Renard, L. 2016. 10 amazing grading apps that help teachers save time. *Bookwidgets Blog* [Online] Available at: https://www.bookwidgets.com/blog/2016/11/10-amazing-grading-apps-that-help-teachers-save-time [Accessed 30 Apr. 2018].

ReSEP Website. *Research on Socio-Economic Policy.* [Online] Available at: http://resep.sun.ac.za/ [Accessed 2 May 2018]

Reynolds, G. 2015. Sitting is bad for children. *The New York Times.* [Online] Available at: https://well.blogs.nytimes.com/2015/09/23/sitting-is-bad-for-children-too/ [Accessed 20 Mar. 2018].

Rizzolatti, G. & Craighero, L. 2004. The mirror-neuron system. *Annual Review of Neuroscience* 27(1): 169-192 [Online] Available at: https://www.ncbi.nlm.nih.gov/pubmed/15217330 [Accessed 30 Apr. 2018].

Rogerson, S. 2011. Information Integrity in the Information Age. In D. Haftor, & A. Mirijamdotter (Eds.), *Information and Communication Technologies, Society and Human Beings: Theory and Framework (Festschrift in honor of Gunilla Bradley)* Hershey, PA: IGI Global.

Robes, J. 2009. Microlearning und Microtraining: Flexible Kurzformate in der Weiterbildung In A. Hohenstein/K. Wilbers (Eds.): *Handbuch E-Learning. Expertenwissen aus Wissenschaft und Praxis – Strategien, Instrumente, Fallstudien. Köln: Fachverlag Deutscher Wirtschaftsdienst.*

Robinson, K. 2010. *Changing education paradigms.* [Online] Available at: https://www.ted.com/talks/ken_robinson_changing_education_paradigms [Accessed 10 Jan. 2018].

Robinson, K. 2010. *Bring on the learning revolution!* [Online] Available at: https://www.ted.com/talks/sir_ken_robinson_bring_on_the_revolution/transcript [Accessed 15 Jan. 2018].

Robinson, K. 2009. *Do schools kill creativity?* [Online] Available at: https://www.ted.com/talks/ken_robinson_says_schools_kill_creativity [Accessed Jan. 2018].

Rouse, M. 2018. Fibre to the home (FTTH). *TechTarget WhatIs.com* [Online] Available at: https://searchnetworking.techtarget.com/definition/fiber-to-the-home [Accessed 01 Aug. 2018].

Rouse, M. 2015. Web 2.0. *TechTarget WhatIs.com* [Online] Available at: https://whatis.techtarget.com/definition/Web-20-or-Web-2 [Accessed 14 Sep. 2018].

Rouse, M. 2013. Mobile app. *TechTarget WhatIs.com* [Online] Available at: https://whatis.techtarget.com/definition/mobile-app [Accessed 01 Aug. 2018].

Rowell, L. 2010. How Government Policy Drives e-Learning. *eLearn Magazine,* October :1. [Online] Available at: http://elearnmag.acm.org/featured.cfm?aid=1872821 [Accessed 10 Feb. 2017].

Runtastic Team. 2017. 6 Reasons sitting is bad for your health. *Runtastic Daily Habits.* [Online] Available at: https://www.runtastic.com/blog/en/6-ways-sitting-bad-health/ [Accessed 20 Mar. 2018].

Rush, F. 2006. *The Cambridge Companion to Critical Theory* (Cambridge Companions to Philosophy) Cambridge: Cambridge University Press

Rushe, D. & Gambino, L. 2017. US regulator scraps net neutrality rules that protect open internet. *The Guardian.* [Online] Available at: https://www.theguardian.com/technology/2017/dec/14/net-neutrality-fcc-rules-open-internet [Accessed 2 May 2018].

Rutherford-Hemming, T. 2012. Simulation methodology in nursing education and adult learning theory. *Adult Learning, 23*(3), 129–137.

S.1177. The Every Student Succeeds Act. 2015. [Online] Available at: https://www.gpo.gov/fdsys/pkg/BILLS-114s1177enr/pdf/BILLS-114s1177enr.pdf [Accessed 30 Apr. 2018].

SAAEA (Southern African Association for Educational Assessment). 2014. A Comparative Report on the Education Landscape of the Countries in the Southern Africa Association for Educational Assessment [Online] Available at: http://www.umalusi.org.za/docs/research/2015/harmonization.pdf [Accessed 4 May 2018].

Saba, F. 2014. Introduction to distance education: theorists and theories – Michael G. Moore [online] Available at: http://distance-educator.com/introduction-to-distance-education-theorists-and-theories-michael-g-moore/ [Accessed 10 Sep. 2018].

Saettler, P. 1990. *The evolution of American educational technology.* Englewood, CO: Libraries Unlimited, Inc.

Sahan, H.H. and Terzi, A.R. 2015. Analyzing the relationship between prospective teachers' educational philosophies and their teaching-learning approaches. Educational Research and Reviews. 10(8): 1267-1275 [Online]. Available at: http://www.academicjournals.org/journal/ERR/article-full-text/599E70652560 [Accessed 2 Jun. 2017].

SAHRC. South African Human Rights Commission. 2012.*SAHRC Charter of Children's Basic Education Rights.* [Online] Available at:

https://www.sahrc.org.za/home/21/files/SAHRC%20Education%20Rights%20Charter_Part1.pdf [Accessed 14 Jun. 2017].

Sallee, M.W. & Flood J.T. 2012. *Using Qualitative Research to Bridge Research, Policy, and Practice.* Theory Into Practice: Qualitative Research in the 21st Century 51(2).

Samelson, F. 1980. J. B. Watson's Little Albert, Cyril Burt's twins, and the need for a critical science. *The American Psychologist*, *35*(7), 619–625.

Samuels, A. 2015. *All you need to know about fibre broadband and the latest Telkom rollout.* [online] Available at: http://www.702.co.za/articles/6219/all-you-need-to-know-about-fibre-broadband-and-the-latest-telkom-rollout [Accessed 13 Feb. 2017].

SAT Website. 2018. Suite of Assessments. *College Board.* [Online] Available at: https://collegereadiness.collegeboard.org/sat [Accessed 30 Apr. 2018].

Sayed, Y. & Motala, S. 2012. Equity and 'No Fee' Schools in South Africa: Challenges and Prospects. *Social Policy and Administration.* 46(6): 672-687

Scanlon, K. 2018. Education Secretary Betsy DeVos declares: 'Common Core is dead'. *Theblaze.* [Online] Available at: https://www.theblaze.com/news/2018/01/18/education-secretary-betsy-devos-declares-common-core-is-dead [Accessed 30 Apr. 2018].

Schunk, D.H. 2012. Learning Theories An Educational Perspective. 6th edition. Boston, MA: Pearson Education Inc.

Schwandt, T.A., 2005. Evaluation as practical hermeneutics. *Evaluation research methods*, *1*: 73-92.

Sharples, M., Taylor, J. & Vavoula, G. 2005. *Towards a theory of mobile learning.* [online] Available at:

https://www.researchgate.net/publication/228346088_Towards_a_theory_of_mobile_learning [Accessed 13 Feb. 2017].

Shenton, A.K. 2004. Strategies for ensuring trustworthiness in qualitative research projects. Education for Information 22(2004): 63-75 IOS Press

Sibaya, D. & Sibaya, P. 2008. Novice educators' perceptions of the teacher education programme proposed by the Norms and Standards for Educators : research article. *Perspectives in Education* 26(4):86-100

Siemens, G. 2005. Connectivism: A Learning Theory for the Digital Age. International Journal of Instructional Technology and Distance Learning. 2(1): 1-8, [Online]. Available at: http://www.itdl.org/journal/jan_05/article01.htm [Accessed 1 Jun. 2017].

Siemens, G. 2004. Connectivism: A Learning Theory for the Digital Age. *elearnspace everything learning.* [Online] Available at: http://www.elearnspace.org/Articles/connectivism.htm [Accessed 12 Sep. 2018].

Simkins, C. 2017. The Department of Basic Education's Three Stream Policy. *Helen Suzman Foundation Website* [Online] Available at: https://hsf.org.za/publications/hsf-briefs/the-department-of-basic-education2019s-three-stream-policy [Accessed 9 Sep. 2018].

Simon, H. A. 1974. How big is a hunk? Science, 183, pp. 482-488.

Skinner, B. F. 1968. *The technology of teaching.* New York: Appleton.

South Africa (Republic). Protection of Personal Information Act. 2013. [Online] Available at: https://www.saica.co.za/Technical/LegalandGovernance/Legislation/ProtectionofPersonalInformationAct/tabid/3335/language/en-ZA/Default.aspx [Accessed 2 May 2018].

South Africa (Republic). The Constitution of the Republic of South Africa. 1996. [Online] Available at: http://www.justice.gov.za/legislation/constitution/SAConstitution-web-eng.pdf [Accessed 6 May 2018].

South Africa (Republic). The South African Schools Act No. 84 of 1996. [Online] Available at: https://www.gdeadmissions.gov.za/Content/Files/SchoolsAct.pdf [Accessed 6 May 2018].

South Africa. National Credit Regulator. 2016. NCR Annual Report 2015/2016. Midrand. [Online] Available at: https://www.ncr.org.za/documents/pages/Annual%20Reports/NCR%20Annual%20Report%202015-16.pdf [Accessed 18 Feb. 2017].

South Africa's Schools. 2017. *South Africa has one of the worst education systems Why it is bottom of the class.* The Economist: Cape Town. [Online] Available at: https://www.economist.com/news/middle-east-and-africa/21713858-why-it-bottom-class-south-africa-has-one-worlds-worst-education [Accessed 23 Mar. 2018].

Spaull, N. 2013. South Africa's Education Crisis: The quality of education in South Africa 1994-2011. *Report Commissioned by the Centre for Development and Enterprise.* [Online] Available at: http://www.section27.org.za/wp-content/uploads/2013/10/Spaull-2013-CDE-report-South-Africas-Education-Crisis.pdf [Accessed 4 May 2018].

Staller, K. 2010. 'Qualitative research', in Salkind, NJ (ed.), *Encyclopedia of research design*, SAGE Publications, Inc., Thousand Oaks, CA, pp. 1159-1163

Stankov, S., Glavine, V & Rosic, M. 2011. *Intelligent Tutoring Systems in E-Learning Environment: Design, Implementation and Evaluation.* Information Science Reference (an imprint of IGI Global). USA: Hershey PA.

Statista 2018. Malawi: Unemployment rate from 2007 to 2017. [Online] Available at: https://www.statista.com/statistics/808778/unemployment-rate-in-malawi/ [Accessed 4 May 2018].

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications, Inc

Sykes, W. 1990. Validity and reliability in qualitative market research: A review of the literature. Journal of the Market Research Society, 32, 289-328.

Talbert, R. 2018. Website *Robert Talbert, PhD* [Online] Available at: http://rtalbert.org/ [Accessed 20 Apr. 2018].

Tanes, Z. 2016. Three Perspectives on Video Game Learning: Behaviorism, Cognitivism, and Constructivism. In H. Gangadharbatla, & D. Davis (Eds.), *Emerging Research and Trends in Gamification* (pp. 167-195). Hershey, PA: IGI Global.

Teachings in Education. 2016. Individuals with Disabilities Education Act: Explained. [Online] Available at: https://www.youtube.com/watch?v=66g6TbJbs2g [Accessed 30 Apr. 2018].

Terrel, SR 2016, *Writing A Proposal For Your Dissertation: Guidelines And Examples*, New York: The Guilford Press, eBook Collection (EBSCOhost), EBSCO*host*, viewed 4 August 2017

The Condition of Education Report.2017. *The Condition of Education.* [Online] Available at: https://nces.ed.gov/pubs2017/2017144.pdf [Accessed 2 May 2018].

The Condition of Education Webpage. *The Condition of Education At a Glance.* [Online] Available at: https://nces.ed.gov/programs/coe/ataglance.asp [Accessed 2 May 2018].

The Condition of Education Report Video. 2017. [Online] Available at: https://www.youtube.com/watch?v=QI_t8X6kxjA [Accessed 30 Apr. 2018].

The Nation's Report Card Website. [Online] Available at: https://www.nationsreportcard.gov/ [Accessed 2 May 2018].

The Nation's Report Card You Tube Video. 2017. *Going digital: NAEP Assessments for the Future.* [Online] Available at: https://www.youtube.com/watch?time_continue=3&v=-RJ4k0I6h2c [Accessed 2 May 2018].

The Nation's Report Card. 2017. *An Introduction to NAEP.* [Online] Available at: https://nces.ed.gov/nationsreportcard/pdf/parents/2010468.pdf [Accessed 4 May 2018].

The Nation's Report Card. 2017. You Tube Channel. [Online] Available at: https://www.youtube.com/user/TheNationsReportCard [Accessed 4 May 2018].

Thomas, K.F. 2017. An Analysis of the Education Decentralization Policy in Malawi. *International Journal of Educational Reform* 26(1): 85-101. Scarecrow Press Inc

Thota, N. 2015 in D'Amato, R, & Van Schalkwyk, G. 2015. *From The Confucian Way To Collaborative Knowledge Co-Construction: New Directions For Teaching And Learning, Number 142*, San Francisco: Jossey-Bass, eBook Collection

Thutong Website. 2018. *South African Education Portal*. Department of Basic Education. [Online] Available at: http://www.thutong.doe.gov.za/Default.aspx?alias=www.thutong.doe.gov.za/mathematics [Accessed 4 May 2018].

TIE vide Teachings in Education. Individuals with Disabilities Education Act: Explained [Online] Available at: https://www.youtube.com/watch?v=66g6TbJbs2g

TIMSS (Trends in Mathematics and Science Study) .2019. TIMMS 2019 Assessment Frameworks. *IEA International Study Center Lynch School of Education, Boston College* [Online] Available at: http://timss2019.org/wp-

content/uploads/frameworks/T19-Assessment-Frameworks.pdf [Accessed 10 Sep. 2018].

TIMSS & PRILS International Study Center Lynch School of Education, Boston College Website. 2018. [Online] Available at: https://timssandpirls.bc.edu/pirls2016/downloads/P16_Framework_2ndEd.pdf [Accessed 4 May 2018].

TIMMS & PIRLS. 2018. TIMSS & PIRLS Website. *IEA International Study Center Lynch School of Education, Boston College* [Online] Available at: https://timssandpirls.bc.edu/ [Accessed 12 Sep. 2018].

TIMSS & PIRLS. 2018. *PIRLS International Achievement You Tube Video.* [Online] Available at: https://www.youtube.com/watch?time_continue=24&v=qoXaHaeOgPk [Accessed 12 Sep. 2018].

TIMSS & PIRLS. 2016. *Introduction to TIMSS & PIRLS You Tube Video.* [Online] Available at: https://www.youtube.com/watch?v=k4PliVwW69Y [Accessed 12 Sep. 2018].

TIMSS & PIRLS. 2016. PIRLS 2016 Assessment Framework 2nd Edition. *IEA International Study Center Lynch School of Education, Boston College* [Online] Available at: https://timssandpirls.bc.edu/pirls2016/downloads/P16_Framework_2ndEd.pdf [Accessed 12 Sep. 2018].

TIMSSSA Website. 2015. *Timsssa.*TIMSS SA, Wordpress [Online] Available at: http://www.timss-sa.org.za/ [Accessed 4 May 2018].

TIMSS & PIRLS Video. 2016. *TIMSS and PRILS IEA Education.* [Online] Available at: https://www.youtube.com/watch?v=BUerCqzZ0NY [Accessed 4 May 2018].

Toprak, E., Özkanal, B., Aydin, S., Kaya, S. 2010. Ethics in E-learning. *The Turkish Online journal of Educational Technology* 9(2):78-86

Training Industry. 2017. *Instructional System Design Training Industry.* [online] Available at:https://www.trainingindustry.com/taxonomy/i/instructional-system-design.aspx [Accessed 8 Jun. 2017].

Transparency International. 2013. *Global Corruption Report: Education.* [online] Available at: https://www.transparency.org/whatwedo/publication/global_corruption_report_education [Accessed 10 Feb. 2018].

Tutu, D. 2015a. *Ubuntu: A brief Description.* [Online] Available at: https://www.youtube.com/watch?v=wg49mvZ2V5U [Accessed 9 Sep. 2017].

Tutu, M. 2015b. *What is Ubuntu.* [Online] Available at: https://www.youtube.com/watch?v=SMSqZckROfA [Accessed 9 Sep. 2017].

20 Time-Saving Grading Apps That Teachers Love. 2018. *Best Colleges Online.com* [Online] Available at: http://www.bestcollegesonline.com/blog/20-time-saving-grading-apps-that-teachers-love/ [30 Apr. 2018].

UNESCO (United Nations Educational, Scientific and Cultural Organization) Website. 2017a. *UNESCO eAtlas of Teachers.* [Online] Available at: https://tellmaps.com/uis/teachers/#!/tellmap/873758989 [Accessed 6 May 2018].

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2017b. *ICT in Education Mobile Learning* [Online] Available at: http://www.unesco.org/new/en/unesco/themes/icts/m4ed [Accessed 8 Jun. 2017].

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2017c. *Global Education Monitoring Report Summary 2017/8 Accountability in education: Meeting our Commitments* [Online] Available at: http://unesdoc.unesco.org/images/0025/002595/259593e.pdf [Accessed 8 Jun. 2017].

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2014a. *Education for All Global Monitoring Report 2014: Teaching and learning: Achieving*

quality for all. [online] Available at: https://reliefweb.int/report/world/education-all-global-monitoring-report-2014-teaching-and-learning-achieving-quality-all [Accessed 10 Feb 2018]

UNESCO (United Nations Educational, Scientific and Cultural Organization). 2014b. Mapping Research and Innovation in the Republic of Malawi. G. A. Lemarchand and S. Schneegans, eds. *GOàSPIN Country Profiles in Science, Technology and Innovation Policy, vol. 3.* United Nations Educational, Scientific and Cultural Organization: Paris. [Online] Available at: http://unesdoc.unesco.org/images/0022/002288/228807E.pdf [Accessed 16 May 2018]

UNICEF (United Nations International Children's Emergency Fund). 2018. *An Everyday Lesson #ENDviolence in Schools.* [Online] Available at: https://www.unicef.org/publications/files/An_Everyday_Lesson-ENDviolence_in_Schools.pdf[Accessed 20 Sep. 2018].

UNICEF (United Nations International Children's Emergency Fund). 2017. *Education Budget South Africa 2017/2018.* [Online] Available at: https://www.unicef.org/esaro/UNICEF_South_Africa_--_2017_--_Education_Budget_Brief.pdf [Accessed 5 Sep. 2018].

US Census Bureau. 2018. U.S. and World Population Clock. [Online] Available at: https://www.census.gov/popclock/ [Accessed 7 Aug. 2018].

USF vide Federal Communications Commission. 2018. *Universal Service fund.* [Online] Available at: https://www.fcc.gov/general/universal-service-fund [Accessed 4 May 2018]

Vahey, P., Roschelle, J., & Tatar, D. 2007. Using handhelds to link private cognition and public interaction. *Educational Technology, 47*(3), 1316.

Vahey, P., Tatar, D., & Roschelle, J. 2004. Leveraging handhelds to increase student learning: Engaging middle school students with the mathematics of change.

Proceedings of the Sixth International Conference of the Learning Sciences (pp. 553560).Hilsdale NJ: Lawrence Erlbaum Associates.

Van den Berg, S. 2015. What the Annual National Assessments can tell us about learning deficits over the education system and the school career year. *Stellenbosch Economic Working Papers: 18/15.* Department of Economics. University of Stellenbosch. [Online] Available at: http://resep.sun.ac.za/ [Accessed 4 May 2018]

Van den Berg, G. and Coetzee, L. 2014. Academic self-Concept and motivation as predictors of academic achievement. *International Journal of Educational Sciences* 6(3): 469-478

Van den Berg, G. 2012. Student perceptions of the lecturer's role in online discussions. *Progressio*, 34(1):71-85

Van Rooyen, B., Newmark, R. & Le Grange, L. 2003. (De)constructing systems discourses in South Africa's Education White Paper 6 : Special Needs Education. *Acta Academia* 35(1):167-189

Van't Hooft, M., Swan, K., Cook, D., & Lin, Y. 2007. What is ubiquitous computing? In M. van't Hooft & K. Swan (Eds.), *Ubiquitous computing in education*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Van Wyk,C. 2015. An overview of Education data in South Africa: An inventory approach. Stellenbosch Economic Working Papers: 19/15. [Online] Available at: file:///C:/Users/Rachel/Downloads/wp-19-2015%20(3).pdf [Accessed 2 May 2018].

Virvou, M., & Alepis, E. (2005). Mobile educational features in authoring tools for personalized tutoring. Computers and Education, 44, 53–68.

Wall Street Journal. 2018. *Moving Upstream. The Robot Revolution: The New Age of Manufacturing.* [Online] Available at: https://www.youtube.com/watch?v=HX6M4QunVmA [Accessed 5 Mar 018].

Wall Street Journal.2017.*Moving Upstream. The Way to Save Opioid Addicts.* [Online] Available at: https://www.youtube.com/watch?v=ClCFwxKuIBM [Accessed 30 Apr. 2018].

Walters, H. 2014. *Why 259 969 people taking the same class at the same time might just be the future of education.* IDEAS.TED.COM. [Online] Available at: https://ideas.ted.com/daphne-koller-on-the-future-of-education/ [Accessed 19 Apr. 2018].

Wang, H. 2012. Interactivity Design in E-Learning: An Integrated Approach. In H. Wang (Ed.), *Interactivity in E-Learning: Case Studies and Frameworks* (pp. 1-28). Hershey, PA: IGI Global.

Ward, T. 2006b. Critical Education Theory Part 2: Constructing a People. [Online] Available at: http://www.tonywardedu.com/images/critical_theory/critical%20education%20part%202.pdf [Accessed 24 Apr. 2018].

Ward, T. 2011. The Need to Change Education. [Online] Available at: http://www.tonywardedu.com/images/critical_theory/the_need_to_change_education.pdf [Accessed 24 Apr. 2018].

Ward, T. 2013a. Critical Education Theory Overview. [Online] Available at: http://www.tonywardedu.com/critical-education-theory/critical-education-theory-overview [Accessed 24 Apr. 2018].

Ward, T. 2013b. A History of Critical Education Theory. [Online] Available at: http://www.tonywardedu.com/critical-education-theory/a-history-of-critical-education-theory [Accessed 24 Apr. 2018].

Ward, T. 2013c. A Chronological History of Critical Education Theory. [Online] Available at: http://www.tonywardedu.com/images/critical_theory/chronology%20of%20critical%20education%20theory.pdf [Accessed 24 Apr. 2018].

WWC vide Institute of Education Sciences. What Works Clearing House Website. [Online] Available at: https://ies.ed.gov/ncee/wwc/ [Accessed 30 Apr. 2018].

Wernet, A. 2013. Hermeneutics and Objective Hermeneutics. In *The SAGE Handbook of qualitative data analysis*

Wikipedia. 2018a. Fibre to the *x* . *Wikipedia The Free Encyclopedia.* [Online] Available at: https://en.wikipedia.org/wiki/Fiber_to_the_x [Accessed 1 Aug. 2018]

Wikipedia. 2018b. Geography of Finland. *Wikipedia The Free Encyclopedia.* [Online] Available at: https://en.wikipedia.org/wiki/Geography_of_Finland [Accessed 1 Aug. 2018].

Wikipedia. 2018c. Institute of Education Sciences. *Wikipedia The Free Encyclopedia.* [Online] Available at: https://en.wikipedia.org/wiki/Institute_of_Education_Sciences [Accessed 12 Sep. 2018].

Wikipedia. 2018d. United States Department of Education. *Wikipedia The Free Encyclopedia* Online] Available at: https://en.wikipedia.org/wiki/United_States_Department_of_Education [Accessed 12 Sep. 2018].

Wikipedia. 2018e. Wiki. *Wikipedia The Free Encyclopedia.* [Online] Available at: https://en.wikipedia.org/wiki/Wiki [Accessed 14 Sep. 2018].

Will, M. 2016. Finland's Education Minister Discusses New National curriculum and PISA Scores. *Education Week Curriculum Matters.* [Online] Available at: http://blogs.edweek.org/edweek/curriculum/2016/10/finland_education_minister.html [Accessed 4 May 2018].

Wills, G. 2015. A profile of the labour market for school principals in South Africa: Evidence to inform policy. *Stellenbosch Economic Working Papers: 12/15. Department of Economics and the Bureau for Economic Research at the University*

of Stellenbosch. [Online] Available at: https://www.ekon.sun.ac.za/wpapers/2015/wp122015 [Accessed 30 Apr. 2018].

Wolcott, H.1994.*Transforming Qualitative Data: Descriptions, Analysis and Interpretation.* London: Sage

World Bank. 2018. Population All Countries and Economies. [Online] Available at: https://data.worldbank.org/indicator/SP.POP.TOTL?name_desc=false [Accessed 7 Aug. 2018].

World Bank. 2010a. The World Bank Projects & Operations Website. *Project to Improve Education Quality in Malawi.* Washington, DC: World Bank [Online] Available at: http://projects.worldbank.org/P114847/project-improve-education-quality-malawi?lang=en&tab=results [Accessed 2 May 2018].

World Bank. 2010b. The World Bank Projects & Operations Website. *Project to Improve Education Quality in Malawi Results Framework.* Washington, DC: World Bank [Online] Available at: http://projects.worldbank.org/P114847/project-improve-education-quality-malawi?lang=en&tab=results [Accessed 2 May 2018].

World Skills Website. 2018. [Online] Available at: https://www.worldskills.org/about/history/ [Accessed 4 May 2018]

Worthington, T. 2017. *Designing E-learning for International Students of Technology, Innovation and the Environment.* TomW Communications Pty Ltd Australia

Yamaguchi, R. & Hall, A. 2017. Compendium of Education Technology Research Funded by NCER and NCSER: 2002-2014. [Online] Available at: https://ies.ed.gov/ncer/pubs/20170001/pdf/20170001.pdf [2 May 2018].

Yin, R.K. 2016. *Qualitative Research From Start To Finish, Second Edition*, New York: The Guilford Press, eBook Collection (EBSCOhost), EBSCO*host*, viewed 8 August 2017

Young, M. 1965. The Rise of the Meritocracy: 1870-2033, Pelican Books, Baltimore

Zawacki-Richter, O., Brown, T & Delport, R. 2009. Mobile Learning: From single project status into the mainstream? University of Pretoria, Pretoria

Zhao & Luo.1999. *Digital Watermark Mobile Agents. Proceedings of the 22nd National Information System Security Conference (pp 7-8).* Hyatt Regency, Crystal City, VA. [online] Available at: https://pdfs.semanticscholar.org/6628/f29dc0f9e8ca688d331cfd5440de76fed6bc.pdf [Accessed 01 Sep. 2017].

Zurita,G. & Nussbaum, M. 2007. A conceptual framework based on Activity Theory for mobile CSCL. *British Journal of Educational Technology.* 38(2):211-235

APPENDIX A: ETHICS APPROVAL FORM

UNISA | university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2018/03/14

Dear Ms Garbers

Decision: Ethics Approval from
2018/03/14 to 2021/03/14

Ref: 2018/03/14/46639985/20/MC
Name: Ms R Garbers
Student: 46639985

Researcher(s): Name: Ms R Garbers
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Telephone: +27 82 929 4293

Supervisor(s): Name: Prof G van den Berg
E-mail address: vdberg@unisa.ac.za
Telephone: +27 12 429 4895

Title of research:

An e-learning framework for instructional design for mobile devices for Africa

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Qualification: M Ed in Curriculum and Instructional Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2018/03/14 to 2021/03/14.

The **negligible risk** application was reviewed by the Ethics Review Committee on **2018/03/14** in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

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The reference number **2018/03/14/32346831/18/MC** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,

Dr M Claassens
CHAIRPERSON: CEDU RERC
mcdtc@netactive.co.za

Prof V McKay
EXECUTIVE DEAN
Mckayvi@unisa.ac.za

RS Language Services

Dr R Snyman

BA (UP) SOD (US) B.Ed., M.Ed., D.Ed.(UP)

Licenciate (Afr) Speech training and drama (University of South Africa)

December 2018

Certificate of Editing

To whom it may concern:

This is to certify that I, Dr Rachel Snyman, have language edited a M.Ed. dissertation written by **Rachel Garbers** titled,

AN E-LEARNING INSTRUCTIONAL DESIGN FRAMEWORK FOR MOBILE DEVICES IN AFRICA

Sincerely,

R. Snyman

Dr. R. Snyman