From digital divide to digital opportunities?

A critical perspective on the digital divide
in South African schools

Greta Björk Gudmundsdottir

Dissertation submitted for the degree of Ph.D.

Faculty of Educational Sciences

UNIVERSITY OF OSLO

2010

Acknowledgements

Umntu ngumntu ngabantu

The isiXhosa proverb above includes the essence of the African concept of Ubuntu and translates as "a person is a person through other persons". Needless to say, I would never have been able to finish this work without the support of many special persons.

First of all, my grateful acknowledgements go to all the learners, teachers, principals, Khanya officials and other South Africans who welcomed me in their beautiful country. I humbly *thank you – dankie – enkosi*. In particular, I would like to extend my gratitude to my good friends and colleagues at the UWC: the dean of the Faculty of Education, Professor Zubeida Desai, the isiXhosa specialist Dr. Vyokazi Nomlomo and the helpful and ever-smiling Rhona Wales and her family. Not to forget Keith, Monde and Rosetta. To my friend Lynette Saunders and her family for kindness and support, to the caring couple Fred and Edna Groener and to my fellow PhD candidates Cheryl Brown and Tony Carr at the UCT for endless advice on ICT issues in South Africa. Furthermore, to everyone connected to the LOITASA research team in Tanzania, in particular Dr. Martha Qorro and Dr. Mwajuma Vuzo.

Three very special ladies have followed me through the whole research process. Two were my supervisors, Dr. Birgit Brock-Utne and Dr. Solveig Jakobsdottir. I have benefited enormously having such excellent scholars from different research traditions guide me through the process. Birgit has shared her experience in Africa and network of friends as well as introduced me to the language issue and its importance for learners on the whole continent of Africa. *Tusen takk* Birgit, for your generosity, your support and great culinary and cultural experiences through the years. Solveig has been my mentor and a great inspiration since we first met when I was her student at the University of Iceland many years ago. Solveig has spent endless hours discussing, giving feedback, mailing, Skyping

and finding time in her busy schedule whenever I have needed her advice. Solveig is not only a great colleague but has through the years become a valued friend. *Kærar þakkir Sólveig fyrir allan stuðninginn í gegnum árin*. The third very special lady is another fellow Icelander, Dr. Halla Björk Holmarsdottir. Halla was the first person I met in connection with the CIE programme at the University of Oslo. She was my supervisor during the writing of my Master's thesis in Namibia, and ever since, she has been of tremendous help. We have shared joys as well as frustrations, but no matter what, Halla is the eternal optimist and the best colleague and a friend one can ask for. *Halla mín ég get ekki þakkað þér nóg!*

At the Department of Educational Research, numerous people have provided their professional support and advice as well as being sources of inspiration and motivation. First of all, I would like to thank my fellow PhD students who have increased my Norwegian "cultural capital" – *En varm takk til dere alle sammen*. Especially, Christian, Dorothy, Janicke, Kenneth, Torill, and Øystein. Moreover, my officemate on the second floor, Kristin "the Wise". Thanks for all the lunches, talks and tears that we have shared through the years, not to mention the beautiful friendship that I cherish very much. I would also like to extend my thanks to other colleagues at the Department of Educational Research who have provided their help and encouragement in different ways. Special thanks to Lene Buchert, Berit Karseth, Ola Stafseng and Tone Solbrekke. To Tone Kvernbekk and Ola Erstad for reading the manuscript and giving valuable feedback at different stages. To the administrative team and the specialists at the IT support office my sincere thanks. Finally, at the University College in Oslo, special thanks to Anders Breidlid for his useful comments on earlier drafts and good discussions through the years.

The lively team of CIE girls, Lihong, Halla, Mette, Kristi, Sheri, Heidi and Jennifer – I would like to thank you all for wonderful gatherings in Oslo and around the world, for your friendship, encouragements, constructive debates and always lots of laughter.

And finally, my heartfelt thanks to my family, who have tolerated periods of long working days and mental as well as physical absences. To my parents for giving me the opportunity to experience the world, but most importantly, I am eternally indebted to my dear Terje and my marvellous quartet, Úlfur, Íris, Kristófer and Sunneva. This work is dedicated to you with never-ending love and admiration. YOU are simply the best!

Table of Contents

List of Figures

List of Tables

List of Abbreviations

CA	Capability Approach
CIE	Comparative and International Education
DoE	Department of Education
EFA	Education for All
Ex-Model C	A Former White School
GeSCI	The Global E-Schools and Communities Initiative
HL	Home Language
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
ICT4E	Information and Communication Technology for Education
ITU	International Telecommunication Union
IWS	Internet World Statistics
LOITASA	Language of Instruction in Tanzania and South Africa
LoLT	Language of Learning and Teaching
MDGs	Millennium Development Goals
MT	Mother Tongue
NSD	Norwegian Social Science Data Service
NTIA	US National Telecommunications and Information Administration
OBE	Outcomes-Based Education
QUAL	Qualitative Methods (within the dominant - less dominant model)
Quan	Quantitative Methods (within the dominant - less dominant model)
SCCF	School Computer Culture Framework
SPSS	Statistical Package for the Social Sciences
UCT	University of the Western Cape
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UWC	University of the Western Cape
WCED	Western Cape Education Department
WSIS	The World Summit on the Information Society

PART I

1.0 Introduction

The global disparity of ICT,[1] the inequality in ICT skills and disparate access to the knowledge society are well documented (James, 2003; Jensen, 2003; Norris, 2001; van Binsbergen, 2004; van Dijk, 2005; Warschauer, 2003b; Wilson, 2004). This disparity relates to the digital divide[2] and to how access and use of ICT are unequally distributed. What is less apparent is how policy reforms, including emphasis on ICT implementation, influence disadvantaged learners and their opportunities to use ICT in a school context. Can comprehensive implementation of computers in schools give disadvantaged learners greater digital opportunities and increase their deprived opportunities outside of school? This study applies a critical[3] perspective on the digital divide in South African classrooms and investigates how increased access to computers may, simultaneously, increase the opportunities of previously disadvantaged[4] learners and exacerbate existing social divides.

The study began with a pilot project in 2006 in two schools in Cape Town (see paper I Gudmundsdottir & Brock-Utne, 2010). Two classes participated in the pilot study. One of them was a typical township class where all the learners were black. The other one was a class with mainly white children in an affluent neighbourhood in Cape Town. The pilot project confirmed earlier research and revealed huge inequalities in the use of ICT, as well as different understandings of and attitudes towards ICT. Furthermore, paper II (Gudmundsdottir & Jakobsdottir, 2009) compares ICT use in schools in South Africa and Iceland and paper III and IV (Gudmundsdottir, 2010a, 2010b) are comparative accounts of four schools in Cape Town, South Africa. The focus is on the concept *digital divide* and on

---

[1] Information and communication technology see further definition of the term in Chapter 2.3.
[2] The concept digital divide will be defined and discussed thoroughly in Chapter 2.
[3] What is meant by the term critical is primarily the awareness of the "limits of knowing" as Spivak (1996, p. 142) claims in her work *More on Power/Knowledge* in addition to my attempt to explore critically indicators of the digital divide within the South African context.
[4] By previously disadvantaged, reference is made to those categorized as coloured, black or Indian under the apartheid rule. It should be noted that the use of such value-laden labels is debated, due to the effect they can have on identity formation and the official discourse in the society. For further reading, Hacking (1995) has written an interesting account of the "looping effect" and how negative language labels individuals and can gradually become a part of the characteristics of the individual. In the remainder of this dissertation the term will be used without *previously* to acknowledge that these groups, and in particular the black population, are to a great extent still in a disadvantaged position.

how the participating learners are using ICT within and between learner groups in and across these four schools.

This introduction (Part I) to the papers (Part II) is presented as follows: it places the study within the tradition of Comparative and International Education (CIE); it introduces the research questions and aims; and it presents a brief overview of the research context. After the contextual discussion, a chapter on the concept digital divide will follow. Chapter 3 will introduce key concepts as well as the theoretical approach and the underlying paradigm of the study while Chapter 4 explains the design and other methodological issues such as the sample, validity, and data analysis. Furthermore, it will point out issues in need for further research and the limitations of this study. Finally, Chapter 5 provides a short summary and discussion of the main content and findings of the papers. It connects the papers to the concept of change and explores the contribution of this study to the research field.

1.1 The comparative tradition

The study is situated within the field of Comparative and International Education. Sadler, one of the first comparative educationists notes:

> In studying foreign systems of Education we should not forget that the things outside the schools matter even more than the things inside the schools, and govern and interpret the things inside... ...A national system of Education is a living thing, the outcome of forgotten struggles and difficulties, and 'of battles long ago' (Sadler, 1979, p. 178).

Within a global world, these words are still highly valid. The field of Comparative and International Education is, however, a relatively young field and has grown from the two directions of Comparative Education and International Education (Crossley & Watson, 2003). It has its backbone in the relationship between education, geopolitical changes and development (Crossley & Watson, 2003). From Sadler's seminal lecture in 1900, quoted above, more recent definitions in the field have come about, namely the theme of borrowing and lending of practises and policies for the purpose of comparing and improving, reforming and developing in a historical, social, and cultural context. Postlewaite (1988, p. xvii) explains his understanding of comparing as follows:

> Strictly speaking, to 'compare' means to examine two or more entities by putting them side by side and looking for similarities and differences between or among them. In the field of education, this can apply both to comparisons between and within systems of education. In addition, however, there are many studies that are not comparative in the strict sense of the word, which have traditionally been classified under the heading of comparative education. Such studies do not compare, but rather describe, analyse or make proposals for a particular aspect of education in one country other than the author's own country.

Moreover, Arnove (2003) describes three dimensions of comparative education:

a) The scientific dimension aiming at theory building and increased understanding of educational systems within a certain social order;
b) The pragmatic dimension which aims at the relationship between policy and practise and how the practises of borrowing and lending can increase our general understanding of educational systems; and
c) The global dimension aiming at greater cross-cultural and cross-national understanding and ultimately leading to peace.

This study attempts, according to the scientific dimension, to increase understanding of the South African educational system, and in particular, the situation of disadvantaged learners who live under challenging social conditions. It has a pragmatic dimension as it views the use of ICT in a classroom setting and links this to existing policy on ICT. Finally, its global dimension is clearly exemplified in paper II (Gudmundsdottir & Jakobsdottir, 2009), which focuses on challenges and opportunities of ICT use in schools in Iceland and in South Africa.

Comparative studies, likewise, embrace different elements and various levels of comparison. Bray and Murray (1995) argue that a majority of research needs to use a multi-level analysis in order to get a "full and balanced understanding of its subjects" (Bray & Murray, 1995, p. 488). Their analytical framework, however, lacks a specific language focus or adequate emphasis on the cultural complexity, which is of fundamental importance in South Africa. The present study approaches the digital divide from different perspectives by using various methods and levels of analysis to provide a holistic picture of its appearance within South African classrooms, which includes a focus on language and simultaneously attempts to understand the cultural complexity within the research context.

1.2 Aims and research questions

This study aims to fill a gap in the understanding of the global proliferation of ICT in education. With its focus on the concept digital divide, the emphasis lies on strengthening the understanding of ICT within a certain educational context and attempting to explain why it is not enough, when addressing the digital divide, to provide everyone with material access to computers. Three journal articles and one book chapter make up the content of Part II of this dissertation; henceforth, they will be referred to as paper I, II, III and IV, respectively. Table 1 provides an overview of the papers, their focus, and key concepts.

Table 1. *The study of the digital divide in South African classrooms.*

Field	Anthropology – CIE – Development – ICT – ICT4D/E[5]			
	Paper I	*Paper II*	*Paper III*	*Paper IV*
Focus	Methodology Reflective pilot studies	Comparative Education	ICT4D	ICT4D
Key words Focus	pilot studies; qualitative research methods; action research; validity	digital divide; national policies; South Africa & Iceland; student skills'; computer culture	digital divide; ICT integration; LoLT; teacher training; disadvantaged learners	capability approach; ICT skills; school use; home access; home language; digital divide; digital equity
Title	Explorative study on the importance of piloting to strengthen validity and research results.	A digital divide. Challenges & opportunities for learners and schools on each side.	When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language	From a digital divide to digital equity: The learners' ICT competence in four schools in Cape Town, South Africa
Source	Journal of Educational Action Research (2010) 18(3),359-372	Nordic Voices. Teaching and Researching Comparative and International Education in the Nordic Countries (2009) 173-201	Information Technology for Development (2010) 16(3), 174-190	International Journal of Education and Development using ICT (2010) 6(2)

---

[5] ICT4D is information and communication technology for development. ICT4E is information and communication technology for education.

The overall research question, which guides the study, is how does the digital divide manifest itself in South African classrooms? Whereas paper I aims at understanding the particular role of reflective pilot studies, it also aims directly at strengthening ties with the critical standpoint of educational research and being a vehicle of better praxis. Papers II-IV relate to the manifestation of the digital divide by focusing specifically on the following research questions:

1. How do Icelandic and South African learners evaluate their computer skills and what are their attitudes in relation to computer use? (paper II)
2. What are the ICT related challenges and opportunities that learners and the educational sector face in the different cultural contexts of Iceland and South Africa? (paper II)
3. What is exacerbating or maintaining the digital divide in schools that already have material access to computers? (paper III)
4. How do linguistic aspects influence the digital divide in the South African classroom? (paper III)
5. Which factors inside and outside of school significantly affect the digital divide? (paper IV)
6. How do these factors affect the ICT skill level of learners and their capabilities? (paper IV)

The aim of Part I of this dissertation is to clarify and provide an overall framework for the papers, which is not exhaustive but is instead seen as an extended abstract. The aim is to provide an overview, or framework, of the most important contextual factors, theoretical dimensions and the methodological approach, which have been influential and inspiring in the research process.

1.3 Research context - The historical framework

When writing about education in South Africa there is a need to explain briefly the historical context of the study. The historical context is especially important where learners have played a pivotal role in the struggle for democratic and equal educational rights and against the segregation and exclusion of the apartheid education system (Clark & Worger, 2004). The contextual factors comprise some of the macro power structures, which are revealed at different levels within the educational system in South Africa.

1.3.1 The apartheid period

For almost 40 years, the apartheid regime practised an inhuman segregation in all layers of society. One of the most influential means of segregation was carried out through education. Educating the different racial groups in separate schools was supposed to create segregated development of the races with the aim of maintaining and protecting "Afrikanerdom", white power and the white race in South Africa. The majority of the people of South Africa, the natives, became the Bantu, which in isiXhosa/isiZulu simply means people (Beinart, 2001) and they were educated to a subordinated place within the society (Clark & Worger, 2004).

The apartheid ideology practised a kind of social Darwinism as racial mixing was seen as threatening the purity of the white race, which would eventually lead to racial decline. The first apartheid act, one of many controversial apartheid acts, was the Mixed Marriage Act (1949), which, together with the Immorality Act (1950), prohibited inter-racial marriages and sexual relationships. Another discriminating act was the Group Areas Act (1950), which included forced removal of people and declared established racial zones for the blacks, coloured, and people of Indian descent. Forced removal from white areas affected 3.5 million people (Beinart, 2001; Burger, 2005), while entrepreneurs and developers could buy their houses cheaply and sell them again "whitewashed" to whites. In every sector of society, the central government ultimately attempted to control the lives of the majority of the population by "reinforcing their allotted role as 'temporary sojourners', welcome in 'white' South Africa solely to serve the needs of the employers of labour" (Burger, 2005, p. 39). One may argue that the cornerstone of the struggle against apartheid was the resistance against the Natives Act (1952), which insisted all black people over the age of 16 had to carry a "pass book" with them at all times, allowing them to work in white areas.

1.3.2 Education and apartheid

The apartheid era had an immense impact on financial aspects, teachers' qualifications, and curriculum materials in educational institutions. More serious, however, was the impact on the mindset of the people through limited educational opportunities. The fact that the African schools[6] received much less financial support meant that they had less opportunities to hire qualified teachers, buy necessary teaching material and give their learners good education (Fiske & Ladd, 2004b). Fiske and Ladd (2004b) moreover state that spending on

---

[6] Schools for the black learners.

each white learner was more than 2.5 times higher than on each black learner, even in 1994 when funding had been substantially increased. In the new South Africa, the situation has changed towards greater equality in public spending devoted to each learner, but the school fee variable has entered the equation[7] (Fiske & Ladd, 2004a).

Prior to 1948, when the apartheid government took over in South Africa, white schools had offered both English and Afrikaans as languages of instruction. With the apartheid regime, schools were declared either a school with English language of instruction or Afrikaans language of instruction. During the apartheid period, one of the measures to reach the goals of racial segregation was to provide instruction in both Afrikaans and in English as well as in African languages in the black schools. This was done to distinguish further the culture and identity of the different racial groups. In 1953, UNESCO published a report supporting mother tongue (MT) language of instruction entitled *The use of vernacular languages in education* (UNESCO, 1953). This was the same year as the Bantu Education Act was passed through the South African Parliament, separating races in educational institutions.

The Bantu Education Act of 1953 included an unbending control over the content of the syllabus as well as the language of learning and teaching (LoLT)[8] (Mesthrie, 2002). Thus, the language issue has been highly segregated and political and still is of immense importance in every discussion about education. The language issue refers to the complex linguistic realities in the country and the implications for all aspects of life (Murray, 2002). Currently there are 11 official languages in South Africa. Their users are supposed to have equal rights and opportunities to use their home language (HL) when encountering and dealing with official institutions such as school.[9] During the apartheid era, it was used as one of the influencing factors of controlling all ethnic groups. The population was divided into diverse ethno-linguistic groups, which further distinguished the English and Afrikaans home language speakers from the African language speakers. In order to strengthen identity

---

[7] See further point 1.3.3 on mobility between schools.

[8] The phrase "language of learning and teaching" (LoLT) is used instead of "medium of instruction" or "language of instruction". When talking about language of instruction it indicates a certain understanding of how teaching and learning takes place. The role of the teachers is more of an instructor where the teacher uses the traditional talk and chalk method. The use of ICT calls for greater participation of the learners and greater cooperation between the teacher and learner. The use of LoLT does to a greater extent imply this changed role and has become widely used in the educational discourse in South Africa after apartheid where emphasis is now on greater participation and different teaching methods compared to those used during the apartheid period (see further Arthur, 2001).

[9] According to the South African constitution: "Everyone has the right to receive education in the official language or languages of their choice in public educational institutions where that education is reasonably practicable" (South African Government, 1996, para. 29/2).

and reinforce cultural purity, learners were segregated according to racial lines[10] (Desai, 1995; Heugh, 2003; Johnson, 1982; Mesthrie, 2002).

Many developing countries in Sub-Saharan Africa "are faced with unresolved questions regarding the choice of language(s) that would best support economic and social development" (Rassool, 2007, p. 15). Brock-Utne and Holmarsdottir (2003) state that choosing the LoLT in Africa is a question intertwined in power and politics, which can reallocate power relations within African countries between the elites and the masses. English has been the dominant language in South Africa for the last decades, and as such, it has gained the underlying power of social mobility and status in the country. Mazrui argues, moreover, that it is "through English as the medium of instruction in African educational institutions that structures of intellectual dependency are reproduced and deepened and of (*sic*) economic dependency reinforced" (Mazrui, 2003, p. 6).

1.3.3 Recent post-apartheid educational reforms

After the destructive impact of the apartheid educational system, it will take decades or generations to restore a good educational system for all (Wilson, 2001). Fiske and Ladd (2004b) state that four aspects of the apartheid inheritance are particularly significant within education:

1. The continuing segregation and poverty among Africans.
2. The insufficient resources and low quality instruction for black children.
3. The low educational achievement among black adults and low student accomplishments.
4. The lack of a satisfactory "culture of learning".

Educational reforms in the new South Africa do attempt to address the mismatch between the different population groups, but there are still clear differences between schools and educational opportunities among learners based on socio-economic status. Motala, Dieltiens and Sayed (2010) argue that a key policy challenge following the emphasis on *Education for All* (EFA) is whether learners are provided with meaningful schooling, with productive learning and with effective teaching. Despite some positive changes in South Africa,

---

[10] Learners went to separate schools according to racial lines. The education system pertaining to each racial group was handled within a system of tricameral parliament (House of Delegates, Assembly and Representatives). Black South Africans were, however, excluded from representation despite being the majority of the population.

Soudien's analysis (2004, p. 101) on the post-apartheid process of integration in South African schools has, for example, shown that:

a) There is an obvious decrease in attendance in the former black schools. Similar movements are not clear in the coloured, white, or Indian schools.
b) Children classified as black form a greater part in the former Indian and coloured schools than in the former white schools.
c) Children classified as black are not entering the Afrikaans-speaking and former white schools to a significant degree.

This indicates that the mobility between schools is such that black parents attempt to send their children to former white schools or former Indian and coloured schools. The mobility to black schools is, however, non-existent. Kivilu, Diko and Mmotlane (2010) argued that there remains racial tension based on the apartheid policy in South African schools and that the access to former white schools is restricted by maintaining high school fees. Recent reforms include issues such as equity of races or ethnic groups, class and languages, but it is the deep-rooted mindset of the South Africans that takes time to change.

Educational authorities have proposed several alternatives in an attempt to acknowledge the equal status of all learners and to even out the existing divides between learner groups in South Africa. One of the alternatives is preparing strategic plans on ICT implementation (Department of Communications, 2010; Department of Education, 2004b; Khanya, 2010; Western Cape Education Department, 2010). These include emphasis on quality education for all and the recognition of the importance of ICT in the empowerment of learners and in societal development.

1.4 ICT in the Western Cape

Since the first democratic elections in South Africa, there has been increased pressure on educational authorities to provide better access to ICT.[11] In a 2004 white paper, the then South African Minister of Education,[12] Ms. Grace Naledi Mandisa Pandor,[13] argued that:

---

[11] For further reading on policy issues and the official rhetoric see Singh's (2010) article in the Journal of Southern African Studies.

[12] The Department of Education in South Africa is responsible for coordinating educational standards at a national level as well as preparing policy documents on education for the country as a whole. South Africa is moreover divided into nine provincial departments of education, which are guided by the national Education Department but have their own priorities, policies and implementation strategies. One of the provincial education departments is the Western Cape Education Department (WCED).

> Information and communication technologies (ICTs) are central to the changes taking place throughout the world. Digital media has revolutionised the information society and advances in ICTs have dramatically changed the learning and teaching process. This has opened up new learning opportunities and provided access to educational resources well beyond those traditionally available. We want to ensure that every school has access to a wide choice of diverse, high-quality communication services which will benefit all learners and local communities. The services provided by the initiative will enhance lifelong learning and provide unlimited opportunities for personal growth and development to all (Department of Education, 2004a, p. 6).

Because of increased ICT awareness, the WCED decided to establish an ICT initiative in 2001 in order to deploy computers in all public schools rapidly. The Khanya initiative, as it was named, aims at providing equal ICT access to all learners and teachers. The WCED's effort aims at eliminating the digital divide between the advantaged and disadvantaged learner groups as well as raising the levels of teaching and learning in disadvantaged schools. Additionally, the WCED through the Khanya initiative deems the delivery and support of the curriculum and educating and supporting the teachers as highly important issues. Moreover, empowering learners to join the global knowledge community, encouraging learners to prepare themselves for careers in the sciences, engineering and ICT, collecting and distributing administrative information, and ensuring that all schools in the province, rural as well as urban, have immediate access to curriculum and administrative information are understood as essential concerns in the Khanya initiative (Western Cape Education Department, 2003). The focus of the Khanya initiative is on literacy and numeracy skills, but eventually the aim is to use ICT across the curriculum in all subjects.

As one of the objectives of the Khanya initiative is to diminish the digital divide, it is relevant to reflect on the role of teachers in a context where resources are limited (see further papers III and IV). Teachers are essential for the introduction of technology-based practices in the classroom (Karchmer, 2001; Su, 2009). Similarly Krumsvik (2008) points out the teachers' key role in ICT use in schools, but argues that a pedagogic framework and didactic content is necessary to increase digital competence in the classroom.

In South Africa's disadvantaged schools, Muwanga-Zake (2007) found that the majority of the teachers struggle when using ICT. The teachers experience that it is difficult to combine computer use with their learners and curriculum goals. Chigona, Chigona,

---

[13] In 2010 Minister of Science and Technology.

Kayongo and Kausa (2010) support these findings in their study among principals and teachers in disadvantaged schools in Cape Town. Moreover Prinsloo and Walton (2008) experienced what they call the first generation skill-and-drill use of ICT in townships in Cape Town. They argue that "the teachers enthusiastically supported the use of this software because it was consistent with their own ideas about how reading as a basic skill should be introduced" (Prinsloo & Walton, 2008, p. 104). Van Wyk (2007), the Khanya programme manager, has argued that the use of computers in some of the Khanya schools is not optimal. This is primarily due to technical problems as the Khanya initiative has limited resources for technical support. Another explanation is that, despite extensive training, teachers are not well equipped to use the technology for its intended purposes. Van Wyk (2007, p. 5) claims that "most likely they're not confident in using technology as a teaching tool. They may be comfortable using it as a productivity tool, but they haven't yet made the shift towards using computers for teaching".[14]

The establishment of the Khanya initiative addresses a growing need and demand for ICT in the educational sector in the Western Cape. It is also seen as a corrective measure in dealing with the previously divided educational system, which allowed some learners to gain better access to knowledge and information than others. In the autumn of 2010, Khanya had implemented, or was in the beginning stages of implementing, computers in close to 1200 schools,[15] which incorporates approximately 24,000 educators and over 800,000 learners (van Wyk, 2010). Through the Khanya initiative, Western Cape learners have received an opportunity to access computers. However, the questions remain how learners are taking advantage of these opportunities, how and if computers are used in the classroom, and if there are other barriers, beyond material access, that hinder that use and contribute to a digital divide?

1.5 ICT use and competence

Before looking at the various aspects of access to ICT and the concept of digital divide, it may be valuable to explore briefly the different terms that relate to the use of computers. In papers I-IV the interrelatedness of access (or lack of access) and ICT use is acknowledged.

---

[14] Indicating use of computers as an administrative tool rather than using it for pedagogical purposes. For further reading on the issue of teacher training in South Africa and how teachers' are prepared for the use of ICT in the classroom see, for example, Chigona et al. (2010); Czerniewicz & Brown (2005); Deacon, Osman, & Buchler (2010); Govender & Maharaj (2007); Hodgkinson-Williams, Sieborger & Terzoli (2007) and Leach (2005).

[15] The total number of public schools in the province is +/- 1500. By the start of the 2012 academic year the aim is to have reached all the schools in the province.

When discussing how learners use computers, international studies and policy documents refer to a variety of terms. In policy documents from South Africa as well as within scholarly debate in South Africa, the term literacy is frequently used (Department of Education, 2004b; Howie, Muller, & Paterson, 2005; Prinsloo & Walton, 2008; Sayed, 1998). Martin (2006) describes the three stages of digital literacy with digital competence as fundamental, leading to digital use and digital transformation at the uppermost level. This author[16] argues that transforming pedagogical practises with ICT goes hand in hand with greater ICT competence. Thus, ICT *competence* is viewed in similar terms as digital competence within the European Union where the term competence relates to:

> The confident and critical use of Information Society Technology (IST) for work, leisure, and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet (European Union, 2006, p. L394/315).

Additionally, the term literacy can be somewhat confusing[17] as it refers to multiple "literacies". As an example, it is used both for traditional literacy as well as in many specific and sometimes conflicting definitions; for example, it is used to refer to multimodal literacy, functional literacy, media literacy and visual literacy. Moreover, learners who are "per definition" computer literate, that is they understand how to use ICT in a learning context, do not necessarily make competent use of it.

Using a term such as competence implies both basic ICT skills, such as being able to open, save, and write a document, as well as the competence required for using the opportunities ICT tools offer for a creative learning environment (such as to evaluate quality of information, retrieving and producing new knowledge) and other less quantifiable elements. The term competence will be used in the following chapters to cover similar interchangeably used terms such as competence, literacy, and proficiency. These are widely used with different prefixes such as information-, ICT-, computer-, e-, or digital-.

In paper II, computer skills and digital competence are used interchangeably within a wider context of a school computer culture framework (SCCF). The framework is focused around skills and attitudes of the learner; it includes how these are influenced by wider

---

[16] When using "this author" or "this researcher" in the text it refers to the PhD candidate.
[17] For further reading, Rassool (1999) offers an excellent discussion on literacy in the context of development. Moreover, Buckingham (2006) defines the term and provides a coherent understanding of its complexity.

macro factors (see further section 3.1). In paper III, the emphasis remains on the cultural context of ICT with particular reference to language using the term ICT competence. In the last paper, paper IV, the emphasis on ICT competence continues with a focus on increasing learners and teachers capabilities to make use of the opportunities ICT brings in a learning context.

In the following chapter, the concept digital divide will be explored further, focusing on different access criteria and learners' ICT competence. The chapter will discuss existing research in the field, attempting to identify where it comes short and where additional research, such as this study, may contribute.

2.0 Contextualizing the Digital Divide

> It is clear that the information era, which is characterized by globalization and capitalism and driven by ICTs, has exposed billions of people around the world to a new form of poverty: information poverty (Britz, 2004, p. 203).

The statement above is related to the central role ICT plays in the globalized world. It has an effect on national development, organizational growth and individual welfare (Selwyn & Facer, 2010). With its meteoric rise, it soon became evident that not everyone had access or equal opportunities to utilize this new technology. As a consequence, discussions on the digital divide became part of the discourse around the information society and digital inequality and e-inclusion (Askonas & Stewart, 2000; Madon, Reinhard, Roode, & Walsham, 2009; Maldonado, Pogrebnyakov, & van Gorp, 2006; Molina, 2003; Warschauer, 2004). However, the concept of digital divide, ever since it first appeared in the mid 1990s, has been understood in various ways (Gunkel, 2003). It has been identified as "a moving target" addressing a plurality of contexts across time and societies (Compaine, 2001, p. 106), from focus on gender disparity (Banerjee, Kang, Bagchi-Sen, & Rao, 2005; Khan & Ghadially, 2010; Sutton, 1991) to civic engagement (Goldfinch, Gauld, & Herbison, 2009; Jennings & Zeitner, 2003; Norris, 2001), ethnicity and minority debates (Cotten & Jelenewicz, 2006; Jackson et al., 2008; Langa, Conradie, & Roberts, 2006) and focus on global or regional disparities (Agarwal, Animesh, & Prasad, 2009; Chen & Wellman, 2004). Yet others, such as Kanwar (2007) and Carter (2007), are critical of the term divide as it calls for bridging gaps, which is not sufficient in order to eliminate existing disparities. Kanwar (2007) calls for a changed discourse based on collaboration and partnership as well as a political will to act in line with a digital dividend instead of a digital divide. Furthermore, James (2009) emphasises the distinction between relative and absolute digital divide.

Related to this, Selwyn and Facer (2010) point out that the digital divide is recently undergoing a sort of reassessment where the discourse can roughly be divided in two groups. The first group greatly dismisses the divide and rather looks at the all embracing use and existence of technology in society. The second group, which is more sceptical, focuses on increasing or deepening divides and unequal distribution of resources and access, especially among disadvantaged or marginalised groups in both developed and developing countries. This study takes the focus of the latter group and looks at the concept of digital

divide and its appearance within selected classrooms in Cape Town where the majority of the learners are disadvantaged.

This chapter provides an exploration of the global context of the digital divide followed by a discussion on the local context on the African continent. It presents an overview of the research field and defines the use of the concept digital divide as applied and understood in the study.

2.1 Global divides

Consenting to the premise that there is a prevalent digital divide in the world, a global divide indicates that countries and regions in the world have different access and opportunities to be a part of the global information society. Castells (2000) is known for his emphasis on the network society and his work on the centrality of 'networks' and 'flows' instead of physical boundaries. As a result, the centrality of ICT, including the Internet, can be said to be "tantamount to marginality for those without" (Castells, 2003, p. 247).

ICT use is still restricted to a limited part of the total world's population. A common understanding of the digital divide has been to view the divide according to geographical or regional lines, a North-South divide, developed – developing, or the West and the rest. The digital divide can furthermore be measured by different indicators such as teledensity,[18] or one could measure the concentration of personal computer (PC) ownership. These indicators of geographical lines and/or teledensity or ownership of computers have their weaknesses. Ownership of mobile phones and access to mobile networks is for example much higher than access to landlines. This is especially the case in countries in the South where access and use of mobile phones are widespread (Etzo & Collender, 2010; Ewing, 2007; Kreutzer, 2008; Palmer, 2010). With regard to ownership of computers, such a factor does not include the actual capabilities of using a computer, and therefore, says little about the digital divide as it is defined in this study (see further section 2.3). Another common indicator measuring the digital divide is to look at the number of Internet users. Such numbers indicate use and access to the Internet instead of measuring ownership of a landline or of a computer and they are used in the following section to explore briefly the global digital divide.

According to an estimate for 2010 from Internet World Statistics (IWS) (Internet World Statistics, 2010e), there are almost 2 billion Internet users in the world (1,966,514,816), which is 28.7% of the world's population based on numbers from June 30,

---

[18] Traditionally defined as access to telephone lines/landline.

2010 (see *Figure 1*). [19] Out of these, 42% of the users are from Asia, 24.2% are from Europe, 13.5% are from North America, and 5.6% of the world's users are located in Africa (see grey columns). When looking at Internet users according to diffusion (penetration) within each region, the numbers change due to population density[20] (see black columns). The majority of the inhabitants of North America are Internet users or 77.4%. In Australia/Oceania 61.3% of the population is online whereas 58.4% of Europeans are using the Internet. In Africa, slightly less than 11% of the population on the continent are using the Internet.

Figure 1. Internet users in the world (Internet World Statistics, 2010e).

---
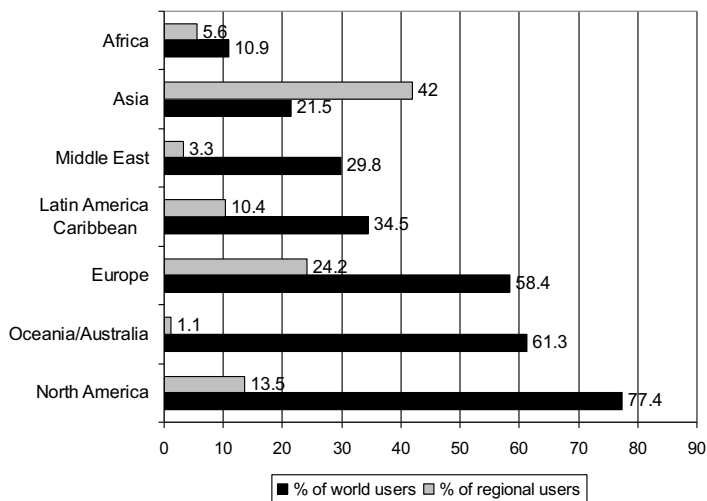
[19] "The ITU [International Telecommunication Union] subscribes to the definition of an Internet user as someone aged 2 years old and above, who went online in the past 30 days. The US Department of Commerce, in contrast, defines Internet users as those 3 years or older who 'currently use' the Internet. The CNNIC [China Internet Network Information Center] defines the Internet user as a Chinese citizen, aged 6 or above, who uses the Internet at least one hour per week. Other market researchers have their own definitions. Internet World Statistics [ITU] believes that a definition must be as general and as simple as possible. For analyzing and comparing Internet users on a global scale, IWS adopts as its benchmark a broad definition and defines an Internet User as anyone currently in capacity to use the Internet. According to IWS, there are only two requirements for a person to be considered an Internet User:
    1) The person must have available access to an Internet connection point, and
    2) The person must have the basic knowledge required to use web technology.
In many Third World countries, one [single] Internet connection may be shared by many individual users. Due to this reason, Internet users might outnumber the amount of Internet access subscribers and also outnumber the telephone lines available in each country" (Internet World Statistics, 2010d, para 12-15).
[20] This indicates that 42% of world users are in Asia but 21.5% of the Asian population are online. In North America the majority of the population is online (77.4%) but these are only 13.5% of the world users.

Even if the numbers of Internet users are increasing in the developing world, there is still a skewed distribution when looking beyond material access and focusing on content and use in general. The difference in access and use has also been described through the rural/urban divide, which is considerable, both in the West and in the rest of the world (Anderson, Courtney, Timms, & Buschkens, 2009).

In Africa as a whole, a modest 10.9% of the total population have access to the Internet. In South Africa alone, 10.8% of the population have access (see *Figure 2*). Compared with other parts of the world, however, the African continent has the highest growth rate of over 2000%[21] for the period 2000-2010. South Africa, in particular, ranks as number 12 regarding population diffusion of Internet usage in and around Africa, with roughly 5.3 million users out of approximately 49 million inhabitants.

Figure 2. Countries in Africa where more than 10% of the population are using the Internet (Internet World Statistics, 2010b).
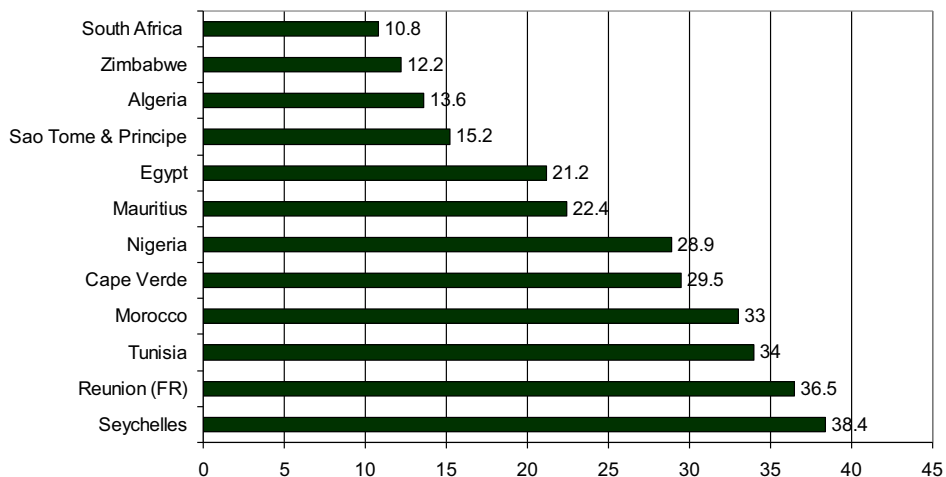
Figure 2 shows that the majority of the countries on the African continent[22] with the highest Internet diffusion are small islands and North African countries. Considering the total Internet users in Africa, 39.6% of them are from Nigeria and 15.4% are from Egypt. South Africans are 4.8% of the users on the continent (Internet World Statistics, 2010b).

---

[21] The average growth on the continent is high due to very low Internet diffusion before 2000. In D.R. Congo for example, which has the highest average growth rate of 72,900%, it can be explained with the huge increase in Internet users from 2000 (500 users) to 2010 (estimated 355,000 users). The growth rate should, therefore, be interpreted with caution.
[22] Note that the figure also includes islands outside the African continent as well as Reunion, which is a French territory.

In order to put these numbers into perspective, similar numbers for the Nordic countries, which are among the countries with the highest Internet diffusion in the world, may assist. In Finland 85.3%, in Denmark 86.1% and in Sweden 92.5% of the population have Internet access. In Norway, 94.8% of the population are connected and in Iceland 97.6% have access to Internet. Viewing the situation outside the Nordic countries and within the European context, Germany is the country with the highest number of users. German Internet users are slightly over 65 million, which is 79.1% of the total population in Germany (Internet World Statistics, 2010a).

2.2 Local divides

Considering the situation in Sub-Saharan Africa and the linguistic and cultural inappropriateness of much of the educational software available, it remains a challenge to raise the capacity of expertise and to adapt technology to the different countries' particular socio-cultural, economic and political environments (van Audenhove, Burgelman, Nulens, & Cammaerts, 1999). The importance of a local initiative and abilities to establish, sustain, and develop ICT is essential. Chen and Wellman (2004) demonstrate that with the proliferation of Internet use in developing countries, the digital divide is statistically narrowing even though it remains substantial and is becoming greater due to lack of skills. Further, they argue that "people, social groups and nations on the wrong side of the digital divide may be increasingly excluded from knowledge-based societies and economies" (Chen & Wellman, 2004, p. 39). While an increasing number of Africans are online, it remains an elite medium with limited opportunities for the disadvantaged and marginalised (Kuttan & Peters, 2003; Olatokun, 2008; Raubenheimer & van Niekerk, 2002; Wilson, 2003). Already in 2003, Kuttan and Peters talk about the situation in Africa as being a "digital abyss" rather than a digital divide while a more recent study characterises ICT access in South Africa as digital apartheid (Brown & Czerniewicz, 2010).

When South Africa abolished the apartheid regime, the nation was optimistic and people believed in new opportunities with an emphasis on equity and justice. New ICT policies included emphasis on bridging the existing digital divide and on the nation becoming an active participant in the new information economy (Czerniewicz, 2004). In a green paper, the Ministry of Communication in South Africa stated that one of the aims of educational authorities was to increase digital literacy and to give everyone in South Africa

the opportunity to acquire basic digital literacy skills (SADoC, 2000, p. 11). However, Kvasny & Hales (2010, p. 262) assert that,

> increased access is a necessary but insufficient remedy for the digital divide, if we are concerned about extending the beneficial outcomes of ICT use to all members of society. The decision to adopt and use ICTs should be driven by the meanings, values, and experiences of individuals. [For that reason] social and cognitive aspects such as power relations, identity, and ideology, as well as technical skills and material resources congeal to determine the consequences of Internet use.

In similar terms, Lor and Britz (2010) argue that having access may indicate that we can use ICT but that does not guarantee active or effective use of it.

In 2007, a large-scale community survey was conducted in all regions of South Africa in order to identify a number of consumer issues. One of these was access to "household goods in working order". In *Figure 3* the numbers relating to ICT tools can be seen in comparison with the results from the 2001 census.

Figure 3. Percentage of households with ICT-related equipment in working condition (Adapted from Statistics South Africa, 2007).
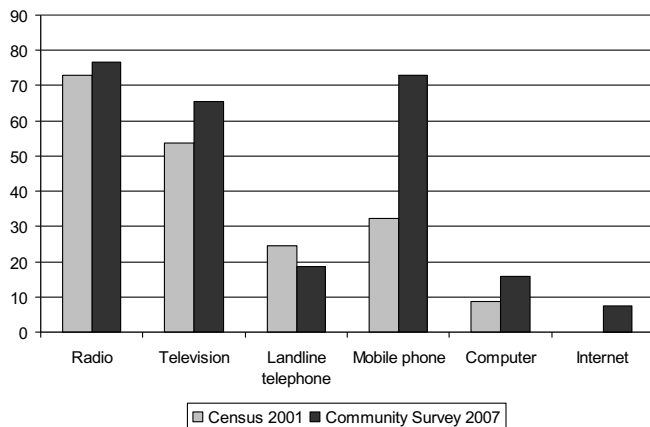
Figure 3 shows the distribution of the different ICTs in South Africa. Whereas radio and television are found in the majority of homes, computers and Internet connections, as well as landline telephones, are not as widespread. However, mobile phones are common.

The focus in this study is to look at access issues and to recognise what influences the use of ICT within the local context of selected South African classrooms. Instead of asking whether we should introduce ICT, which is often the question when discussing ICT in the context of developing countries, we should rather focus on how to introduce the technology to all learners in all layers of society.

2.3 Defining the digital divide

It was not until the *Falling Through the Net* report from the US National Telecommunications and Information Administration (NTIA) appeared in 1999, that the digital divide was clearly defined as referring to those with access to new technologies or ICTs[23] and those without. Being a multidimensional phenomenon, there are various ways to approach the concept, which have already been mentioned. Even though technological dualism and unequal information access had already been explored in the early 1970s (Singer, 1970), the term did not become widespread within scholarly or public discourse before the mid 1990s (Yu, 2006). Subsequently, research on the digital divide became a theme within a wide range of disciplines (Yu, 2006) and a number of scholars have conducted comprehensive research in the field.

It can be argued that, after the year 2000, the focus changed to the "second order digital divide" as opposed to a "first order" categorisation of focusing only on material access (van Dijk & van Deursen, 2010, p. 279). Increasingly, discussions on the digital divide do include dimensions from the social and cultural environments of the users (Brown & Brown, 2008; Compaine, 2001; van Dijk & van Deursen, 2010). Part of the new trend is also to focus on the use of ICT for empowerment (Joseph & Andrew, 2009). Such emphasis can be connected to the field of functional/digital literacy, which takes account of the applicability of the technology and what is needed in order to function in a digital world (Prinsloo & Walton, 2008; Saldanha, 2005; Sayed, 1998; Warschauer, 2004).

When Warschauer (2004) connects the digital divide to wider social inequalities and inclusion, it is in line with how the term is applied in this study. Warshauer (2003a, p. 297) asserts that inequality of access to online information is based on the "…political, economic,

---

[23] ICTs applies in general to a range of digital technologies such as broadcasting technologies (radio), computer hardware and software, mobile phones and so forth as well as "older" technologies such as overhead projectors, video and analogue radio. As such, it refers to different tools. The concept has also been used in a wider context referring also to the applications or the ways of working with ICT (Loveless & Ellis, 2005). Henceforth, it will be used in its broader understanding including also the ways of dealing with the technology. Moreover, for the sake of consistency, the term will be used in singular (ICT) even though it is characteristically plural as it refers to a range of different tools and applications.

institutional, cultural, and linguistic contexts that shape the meaning of the Internet in people's lives. Thus the inequality that does exist is social, not digital". The challenge is, therefore, to dismantle the social, cultural and linguistic barriers connected to use of computers and Internet. Warschauer makes use of a definition based on access to different resources relevant for social inclusion and the use of ICT whereas van Dijk (2005) recognized four different barriers to access:

a) The mental access barrier, which consists of lack of interest in the technology and/or computer anxiety
b) The material access barrier including the lack of access to computers and Internet connection
c) The skills access barrier, which includes inadequate education or training, lack of user friendliness and so forth
d) The usage access barrier embracing lack of opportunities one has to access the technology (van Dijk, 1999)

Calderaro (2010, p. 39) defines the concept digital divide as the "gap between those who actively use and contribute to the Internet, and those who are only influenced by it". Similarly the UN ICT task force includes the understanding of the importance of being able to use the technology effectively, which is influenced by the imbalances in access to resources and skills (GESCI, 2010). This is also in line with how Wilson (2004) emphasises computer use by marginalised and disadvantaged groups as not only a matter of technology as such, but highly dependent on surrounding economic, societal, and educational structures. The contribution of van Dijk's and van Deursen's (2010) cumulative model of successive access to digital technologies has exposed different levels of access leading to the competence to use ICT. Moreover, the former Bridges initiative (Bridges.org, 2005) adds several specific dimensions to a "real access" criteria focusing, in particular, on the macro level. These dimensions all add to a holistic understanding of the digital divide.

Yu (2006, pp. 240-241) provides an overview of different studies on the digital divide and information inequality and recognizes several social aspects, which generally influence limited use of ICT and, in consequence, the digital divide (see Table 2).

When seeking a definition of the term, Table 2 shows different aspects influencing the digital divide. Henceforth, the understanding of the digital divide[24] in the study

---

[24] The concept digital divide is used for Internet use as well as offline use of computers. To include only Internet use gives an unnecessarily negative picture of the situation in Africa where access to computers is much higher than online use.

acknowledges the need for reconceptualising the term and applying a critical perspective on the use of ICT among disadvantaged learners.

Table 2. *Social factors influencing the digital divide* (Adapted from Yu, 2006, pp. 240-241).

Age	Increased age associated with decreased levels of access, limited modes of use and patterns of connecting. Age differences are especially pronounced in those individuals aged 60 years and over.
Culture/Social Participation	Communities and individuals with higher levels of social contacts tend to make more use of ICTs.
Education	Lower levels of education are also shown to be associated with digital divides concerning access to and use of a range of ICTs.
Family structure	Family composition, adult caring responsibilities (i.e. for an older parent) tend to be associated with less contact with ICT. Conversely, the presence of school-age children within the household tends to increase contact with ICT.
Gender	Whilst gender differences were associated with digital divides during the 1990s, more recent academic research seems to indicate declining gender differences in ICT access and basic levels of engagement.
Geography rural-urban location	Levels of ICT use are generally less in rural and inner city areas, although often differences are not evident once other socio-economic variables are taken into account.
Income socio-economic status	Lower levels of income are consistently shown to be associated with digital divides concerning access to and use of a range of ICTs.
Race	Some US studies report lower levels of access and use amongst African-American and Latino populations. However, many studies report that racial differences in ICT use disappear when issues of income and education are taken into consideration.

Figure 4 refers to a cumulative and multi level view of the digital divide as it is applied in the study.[25] In order to explain the figure, first of all the basic needs of the users[26] need to be

---

[25] The framework is adapted from various sources within the digital divide literature (Bridges.org, 2005; UNESCO, 2002b; van Dijk, 1999; van Dijk & van Deursen, 2010; Warschauer, 2004), but it reflects the author's own interpretation of the phenomena and how the findings presented in papers I-IV can be explained.
[26] Here it applies to basic needs such as housing, food and security.

considered. For marginalized or disadvantaged users in developing countries in particular, it is argued that the integration of ICT in education should not be considered as the ultimate goal of quality education. On the contrary, ICT integration can exacerbate existing divides in society if it does not consider different layers and influencing factors of the divide (such as the opportunity, skills and relevance divide). The second aspect in the figure is the material divide, which is often the primary focus. The emphasis on the material divide is limited in this study. Yet it is acknowledged that the material divide is a prerequisite for any use of ICT as it indicates access to computers, software, hardware, and infrastructure. The two other divides connected to the material divide are the opportunity divide and the skills divide. These three divides (material, opportunity and skills) are dependent on each other. The relevance divide is surrounding all the other divides indicating the importance of appropriate technology and content at all times.

Figure 4. A cumulative view of the digital divide.
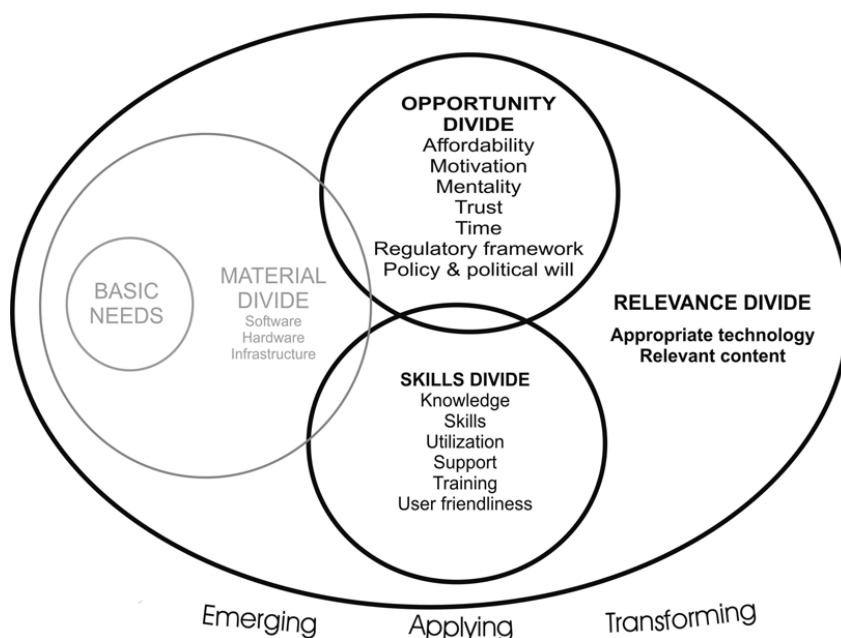
As a point of departure, this study is conducted in schools where the learners already have access to ICT. The focus in the papers is, therefore, primarily on the three remaining aspects of the divide: opportunities, skills, and relevance. Simultaneously, *Figure 4* reveals different approaches to ICT integration in a classroom setting, equivalent to those found in

the UNESCO model of ICT integration (UNESCO, 2002b). The integration starts with the emerging level when computers are introduced in schools. It is followed by the opportunity and skills divide, which differentiates the users who have started using (applying level) computers and those who have not. The relevance divide is placed as the optimal level and is connected to the capacity to transform pedagogies in the classroom and to empower learners. As such, it relates to the most valuable use of ICT where learners and teachers have access to appropriate technology suited to their surroundings as well as to relevant content in a relevant language. It is with the relevance divide that this study contributes to a greater awareness and a holistic understanding of the phenomena.

Paper I relates to a pilot study and the cumulative model of the digital divide is viewed at all levels. One township school with no material access to ICT is compared to a school with good resources and relevant technology use. As such, in paper I the span of the divide in two classrooms is explored. Because of this pilot study, the research focus changed and became more specific to emphasise disadvantaged learners in schools where ICT had already been integrated but where learners had limited digital opportunities and skills.

In paper II, the comparison between two countries, Iceland and South Africa, reveals some of the challenges as well as some of the opportunities of ICT use in different cultural settings. The paper reflects both on the material divide in the two countries and on the opportunity, skills, and relevance divides.

In papers III and IV, a more specific focus is adapted. In paper III, the skills divide from a teachers' perspective is investigated and the lack of teacher training and support is criticised. Some of the language implications relating to the relevance divide are also revealed. In paper IV, the focus is on use of computers in school and out of school and on how the material and opportunity divides between different learner groups influence the skills divide.

In all the papers, I-IV, the importance of addressing the relevance divide is acknowledged as providing relevant technology and relevant content in a relevant language.

2.3.1 The relevance divide

A significant part of the relevance divide in the cumulative model is the language dimension. Keniston (2001a, 2001b, 2004; Keniston & Kumar, 2004) has explored the influence of language on the use of ICT in developing countries. He looks at how the English language influences power structures in the society and to what extent these

influence access to and use of ICT. Keniston's research material originates from India and South East Asia, but his findings are also relevant and adaptable to an African setting where language often plays a decisive role in defining status and class (Mesthrie, 2002). Keniston (2001b, p. 283) argues that language plays a key role in defining "who benefits, who loses, who gains, who is excluded, who is included - in short, how the Information Age impacts the peoples and the cultures of the world". Wasserman (2002) has explored the position and the status of South African languages in connection with new media in South Africa. In his work, he argues for the importance of relevant and appropriate content in the home languages of the learners. As Wasserman understands ICT use, it can reinforce and empower the indigenous languages and "serve as a validation of cultural identities that have either been oppressed during apartheid, or marginalized in the public sphere in the post-apartheid era" (Wasserman, 2002, p. 305). Furthermore, van de Bunt-Kokhuis (2001) and Main (2002) claim that in order to develop a global information society, software and content on the Internet need to be meaningful for different user groups with varied cultural backgrounds and different languages. Osborn, who has worked on the localization of ICT in Africa for many years, additionally argues, "[i]n principle, ICT should be capable of accommodating people in any language and serving as a tool for development in its fundamental and most comprehensive sense of revealing potentialities" (Osborn, 2010, p. 8). He continues by saying, "It is generally agreed that the availability of software and content in the languages most familiar to users is an essential element in the adoption and optimal use of computers and the Internet" (Osborn, 2010, p. 12).

A UNESCO report on linguistic diversity on the Internet stated that the digital divide cannot be seen only as access to technology but more important is the issue of language and language diversity (Funredes, 2005). Much of the available software in the world is only available in English and English has become the lingua franca of the Internet (Crystal, 2001; Korpela, 2003; Wasserman, 2002; Yano, 2001). In order to explore this a bit further Table 3 shows an overview of the most used languages online. The table discloses the growing use of Chinese on the Internet notwithstanding English which is by far the most diffused language online. Keeping in mind that African languages represent 2/3 of languages spoken in the world and contain a wealth of culture and diversity (Fantognan, 2005), none of them are influential enough to belong to the most used languages on the Internet (Internet World Statistics, 2010c). The former colonial languages, which are widely used in African schools

as the LoLT, affect the importance and status of the African languages[27] (Heugh, 2003; Kwaa Prah & Brock-Utne, 2009).

Table 3. *Percentage of total Internet world users by language* (Internet World Statistics, 2010c).

English	27.3%
Chinese	22.6%
Spanish	7.8%
Japanese	5%
Portuguese	4.2%
German	3.8%
Arabic	3.3%
French	3%
Russian	3%
Korean	2%

Fantognan (2005) states that, considering online activities, African languages appear more as a topic of study. That implies that they are referred to, used in documentation, described, used as samples, and referenced in texts and courses rather than being used as a direct means of communication online, let alone written in an African language or by Africans themselves. Corresponding to Fantognan's understanding, Wasserman (2002) argues that before the Internet can vitalize language and promote multilingualism or multiculturalism, access inequalities need to be overcome. In order to create something new, rather than reinforcing existing divides, inequalities need to be addressed. Many argue that in South Africa, the digital divide is directly related to inequalities in access, which are linked to the colonial and apartheid legacy (Zegeye & Harris, 2002). Such inequalities further shape educational opportunities and access to education in general in South Africa (Abdi, 2001; Crouch, 1996). Yet Fataar (1998) points out that there has been an increase in school attendance and that there is better educational access for all learner groups in the new South Africa. However, the quality of education and the situation in schools with regard to equipment, educational level of staff and vision varies greatly in South Africa (Abdi, 2001; Fataar, 1998).

---

[27] This will be elaborated on in Chapter 3.2

2.4 Conclusion

Even though one can assume that the access to ICT is becoming increasingly common, according to the number of users globally, there is a prevailing disparity in the skills and opportunities to use ICT and in the relevance of content. This author argues that, focusing on different divide levels hindering people's use of ICT and participation in the knowledge society, the cumulative model of digital divide provides a holistic understanding of the phenomena. One first needs to focus on the basic needs and how they hinder people's use and motivation to use ICT. After that, the focus can move to the material divide, the opportunity divide, and the relevance and skills divides. When Kanwar (2007) calls for a change in the discourse, focusing on digital dividend, it also reflects the discussion on whether or not developing countries can leapfrog some of the technological developments in the North. Steinmueller defines leapfrogging as "bypassing stages in capacity building or investment through which countries were previously required to pass during the process of economic development" (Steinmueller, 2001, p. 2). He implies that developing countries do not need to take the same path as developed countries. This is further addressed in the next chapter on theoretical perspectives on ICT in education and development.

3.0 Theoretical perspectives on ICT in education and development

The theoretical perspectives will be presented in this chapter. They reflect the search for an appropriate theory synthesising ICT in education and development. The aim is to discuss and explain the underlying paradigm and theoretical underpinnings used in the study. The theoretical framework aims to identify and capture some key concepts and how they are connected to the analysis, providing a greater understanding of the overall research question: *How does the digital divide present itself in South African classrooms?*

The transformative paradigm and critical theory perspectives have influenced and inspired the studies' ontological, epistemological, methodological and thematic emphases.[28] Perspectives from the discourse around the field of development and ICT, more specifically the relatively recent field of Information and Communication Technology for Development/Education (ICT4D/E) and the capability approach (CA), also constitute an important contribution to the theoretical backbone of the study. Furthermore, building on the interdisciplinary traditions of comparative and international education, one can argue that the study uses a synthesis of various approaches in order to reach a comprehensive understanding of the phenomena digital divide. The study is based on empirical data, and as such, the theoretical framework provides insight and a framework for analysis of the appearance of the digital divide in a certain cultural and educational setting. However, it is not the intention to test theoretical assumptions or to contribute to the development of the theoretical approach as such.

As has already been discussed in previous chapters, the concept *digital divide* is the central concept of the study, together with the focus on *ICT competence*. The digital divide has been defined as "the gap between those people with effective access to digital information and communication technology (ICT) and those without" (GESCI, 2010). It furthermore includes a view on societal factors that influence the imbalances in material access to technology as well as the imbalances in the skills and opportunities to use ICT effectively.

When considering what defines the different access criteria, and thus the digital divide, there are several key concepts that serve as starting points in this theoretical discussion. First, operating in a multi-ethnic and multi-lingual context, the understanding of

---

[28] This is explained in detail at the end of this chapter.

cultural diversity is central. Consequently, this chapter is structured as follows. The introduction on the purpose of the chapter and the understanding of the digital divide, will be followed by a discussion on additional key concepts: a) *cultural diversity*, b) *language*, and c) *power*. Subsequently, the discussion is connected with the capability approach, which serves as a micro perspective, viewing individual or groups' capabilities to use ICT. The capability approach further provides a link to theories of development, which serve as a macro perspective on the thematic emphasis in the study: ICT4D and ICT4E. This part has a specific focus on synthesizing the field of ICT and development. Finally, the overall transformative paradigm will be introduced; more specifically, critical education theories are added to frame the theoretical discussion.

3.1 The understanding of culture and cultural diversity

One of the first and most methodologically challenging aspects of conducting research in South African schools is the cultural diversity and multicultural aspects, which influence the education system in post-apartheid South Africa. The importance of cultural diversity and relevance for the integration of technology is evident in the words of Gyekye (1997, p. 37) who argues, "Ideally, technology, as a cultural product, should rise from the culture of a people, if it is to be directly accessible to a large section of the population and if its nuances are to be fully appreciated by them".

In South Africa, the term culture is highly value-laden and is related to different dimensions and the interconnectedness of language, ethnicity, and class. De Sardan (2005) points out that culture is based on common conceptions shared by a group of people, but it also involves constant change in norms and values within the group. Henceforth, the terms cultural complexity and diversity are used interchangeably as both refer to the multiplicity and richness of the South African (multi)cultural society in positive terms.

McLaren (2006) discusses class antagonism as one of many social antagonisms such as race, ethnic group and gender, which influence and reproduce the others. These factors influence learners' social contexts and their physical environments, their situations at home, in which communities they live and what kind of schools they attend. Cultural diversity is perceived as including dimensions of class, language, and status within the South African context. Reagan (2005), moreover, argues that the term culture may have been the most maltreated concept in 20th century South Africa due to its application in support of the apartheid regime.

In an attempt to define the word culture, Gyekye (1997) considers culture as socially constructed whereas cultural anthropologists such as Hannerz (1992) believe that culture can be found both in the "mind" and in "public forms", that is within the individual as well as in his/her social/cultural surroundings. For the purpose of this study, the broad definition from UNESCO is applied. It defines culture as

> the set of distinctive spiritual, material, intellectual and emotional features of society or a social group and… …it encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs (UNESCO, 2002a, para. 5).

Hence, cultural diversity is viewed as the antonym of cultural uniformity. UNESCO's *Convention on the Protection and Promotion of the Diversity of Cultural Expressions* defines cultural diversity as "the manifold ways in which the cultures of groups and societies find expression. These expressions are passed on within and among groups and societies" (UNESCO, 2005, article 4 para. 3). These definitions can open up understanding of the many factors influencing people's or groups' cultural identities, and at the same time, raise the awareness of their importance within social research and the significance of different access to resources and power.

In 2005 South Africa ratified *UNESCO's Convention on the Protection and Promotion of the Diversity of Cultural Expressions* together with 185 other member states (UNESCO, 2010). The convention represents the first international standard on cultural diversity and its preservation. Several key topics on cultural rights can be identified from the declaration. Three of them are of particular importance for the context of this study as they refer to the framework used to define influencing factors on how South African learners use ICT.

1. The understanding of the different social, economic, cultural, political and legal backgrounds of the group/culture;
2. The emphasis on linguistic diversity, with a special focus on mother tongue and;
3. The participation and inclusion of all (UNESCO, 2005).

These aspects of cultural rights have been taken into account when analysing how learners of different ethnic and linguistic groups are using ICT in the South African context. Moreover, the school computer culture framework (SCCF) (Jakobsdottir, 1996) was used as an analytical tool in paper II (Gudmundsdottir & Jakobsdottir, 2009), which adapts some

aspects from the declaration in order to explain divides in a global context (see *Figure 5*). It indicates the different factors influencing computer use both at the school level (micro level) as well as outside the school, at home, within the communities and at the societal level (macro level). The SCCF does not, however, include the linguistic aspect specifically and its importance for access and inclusion. The linguistic aspect will consequently be discussed in the next section, as it was a significant concept in the remaining papers.

Figure 5. A school computer culture framework (adapted from Jakobsdottir, 1996).
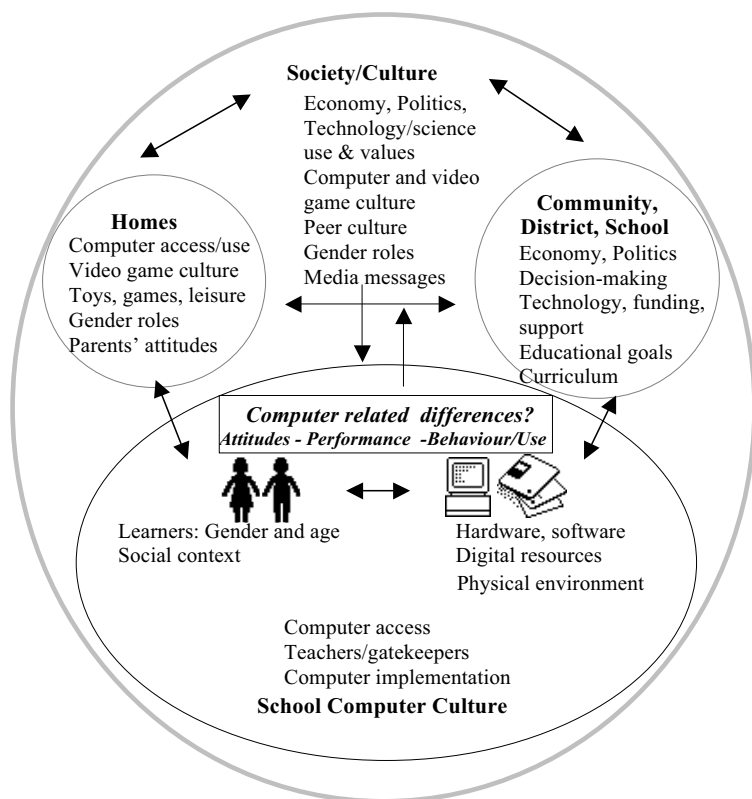
3.2 The understanding of language in a South African context

Innovations, reforms and policies, lacking connection to and understanding of local cultures, have, through centuries, been forced upon African countries (Smith, 1999). Recognising indigenous forms of learning in a local language has not been considered, and instead, "the globalisation of knowledge and Western culture constantly reaffirms the West's view of itself as the centre of legitimate knowledge" (Smith, 1999, p. 63). Accordingly, the most

common LoLT from grade four in South Africa is English. This is despite the fact that less than 9% of the total population have English as their home language (Holmarsdottir, 2005; Silva, 2006). Too often it is believed that Western practises are universally fitting (Brock-Utne, 2000; Chambers, 1997). Many scholars see this as yet another form of post-colonialism where former colonial powers hold on to their influence through, for example, Western style educational policy, school books and the LoLT (Brock-Utne & Hopson, 2005; Nyambe & Griffiths, 1999).

Research results show that learners gain a better understanding of the subjects when taught in their own home language. When considering the implications of language in the South African educational context, extensive research is available on the mediating effect of language on learners' acquisition of knowledge, their understanding, and use of knowledge as well as the ability to use learning materials of any kind (see for example: Alexander, 1989, 2000; Brock-Utne, Desai, & Qorro, 2003, 2004, 2006; Desai, 1995, 1999, 2001; Heugh, 2000; Holmarsdottir, 2005; Nomlomo, 2006; Plüddemann, Mati, & Mahlahela-Thusi, 2000). Hence, the underlying notion in the study is that children learn best through the medium of their own mother tongue or home language.[29]

Furthermore being able to use your home language when applying ICT can support the survival of language and language diversity (Buszard-Welcher, 2001; Fantognan, 2005; Nathan, 2000; Paolillo, 2007). However language and ICT are seldom a central focus in existing research on the digital divide as has already been discussed in Chapter 2. In order to avoid widening existing divides, as Holderness (2006) points out, ICT use needs to adapt to the local context, local languages and local realities. This is not to be understood that African languages can or should replace dominant international languages. Coherent with what Desai argues:

> There is no disputing that in a country like South Africa, proficiency in a language like English is necessary for interaction at particular levels with the outside world. But it is problematic to make the possibility of such interaction the basis for designing language in education policies for the majority of the population (Desai, 2003, p. 47).

---

[29] The *Language of Instruction in Tanzania and South Africa* (LOITASA) project has compared learning in classrooms that employ a familiar language versus learning that takes place in English (LOITASA, 2010). This study has a close connection with the work of the LOITASA group as it examines how ICT is implemented and used by learners and teachers in four different schools in Cape Town. The four schools have learners with different HL and cultural backgrounds and use different LoLT.

Such a view emphasises local languages in the classrooms, but at the same time, recognises the importance of English as a subject within the school curriculum. However, the two former official languages in South Africa, English and Afrikaans, are still so powerful that "there are few incentives for non-African-language speakers to learn African languages and for African learners to exercise their rights pertaining to their languages" (Mda, 2004, p. 183).

This can also be an underlying reason why producers of software do not emphasise translating or developing software in the African languages. Likewise, non-native English speaking parents in South Africa often choose English as the LoLT for their children, because of the status it brings and are, therefore, caught "between the high status of English as a means of socio-economic mobility on the one hand, and the cognitive and cultural benefits of isiXhosa as a home language on the other hand" (Nomlomo, 2006, p. 113).

Even though the white paper on e-education in South Africa recognizes the importance of local content development and use in fighting the digital divide (Department of Education, 2003), it is difficult to manipulate established power structures that influence choices, emphases and the realities when integrating ICT into South African schools. The notion of power is, therefore, the next key concept to be discussed.

3.3 The understanding of power

The interconnectedness between class, status, ethnicity, and language in South Africa has already been mentioned (see section 1.3.3). As Soudien argues:

> Race, class, gender, and language in South Africa are implicated in a complex of signs that are part of a process of profound social realignment in the country. This realignment is not simply a racial or a class or a gender realignment but is pivoted on the contingencies of the new post-apartheid landscape in which dominance is reinterpreting itself and is being reinterpreted (Soudien, 2004, p. 111).

The reinterpreting of dominance, which Soudien examines here reflects the new realities in South Africa. Soudien points out the importance of destabilizing the power that follows the language of race in order to deconstruct earlier power positions and to force people to reposition themselves (Soudien, 2004). Wolpe (1988), however, questions the whole use of class and race when defining the South African identity and calls for a greater inclusion of the political arena to understand the power imbalances in the society.

In the new South Africa, learners in the same school increasingly use diverse home languages and are of different ethnic backgrounds. Their socio economic status and class are the new dividing line in the society rather than race or ethnic group.[30] In that sense the locality or neighbourhood of schools does, to a large extent, define the socio economic status of its learners and their families.[31]

This discourse around subordination necessarily brings focus to the concept of power. The concept of power also has a direct connotation to the apartheid system of South Africa. Through decades, power struggles have been a considerable factor in the everyday lives of South Africans and the education system is still influenced by the imbalances of the apartheid heritage. These struggles can, for example, be seen in the disparities between schools in different areas of Cape Town. The schools' physical environments differ; access to resources such as libraries, counselling, schoolbooks, and computers varies. Moreover, the class sizes vary and so does the availability of extracurricular activities and human resources such as the number of teachers and other qualified personnel. Township schools, with mainly black learners, have, in general, fewer resources and a different learning environment than the schools in typical middle class areas of Cape Town (Fiske & Ladd, 2004b; Motala et al., 2010; Oyedemi, 2009; Pillay, Roberts, & Rule, 2006; Soudien, 2004; Wilson, 2001). Undeniably, South Africa still struggles with extreme inequalities between different population groups and these inequalities are mirrored in the educational system. All these issues together with previous discussions on digital divide, ICT competence, language, and cultural diversity can be viewed within a framework of access and power (or the lack of it). In order to address some of these inequalities and power imbalances, the WCED has emphasised the implementation of ICT in all public schools. This applies both to learners in poorly resourced township schools as well as to learners in the schools found in the more affluent parts of town. Power or more correctly the lack of power is playing a role with regard to access to knowledge and learners' possibilities to participate actively in the information society. In the following section, the connection between knowledge and power will be discussed within a societal (macro) framework.

---

[30] The terms race and ethnic group are used interchangeably since both terms are used in the literature. Race, however, refers to biological differences whereas ethnic group includes peoples' cultural inheritance and cultural background as well.

[31] This is connected to the division in quintiles (see paper IV footnote 11 and Gilmore & Soudien, 2010).

3.3.1 Power, knowledge and discourse

> Education may well be, as of right, the instrument whereby every individual, in a society like our own, can gain access to any kind of discourse. But we well know that in its distribution, in what it permits and in what it prevents, it follows the well-trodden battle-lines of social conflict. Every educational system is a political means of maintaining or of modifying the appropriation of discourse, with the knowledge and the powers it carries with it (Foucault, 1972, p. 227).

These opening words from Foucault's well-known work on *The archaeology of knowledge and the discourse on language* are relevant for the context of this study. Even though Foucault can hardly be viewed as a critical theorist,[32] his analysis of power relations is relevant for the cultural diversity and multilingual South Africa. It provides a pertinent explanation of some of the underlying dimensions of power within the South African society and of how they have influenced the use of ICT in schools.

Foucault discusses "'fellowships of discourse', whose function is to preserve or to reproduce discourse, but in order that it should circulate within a closed community, according to strict regulations..." (Foucault, 1972, p. 225). Whereas the Internet is often considered as an open fellowship in which everyone can participate, the focus in the present study is to look at those falling outside the fellowship and those not having equal opportunities to participate in the discourse due to their language background, cultural background, and or limited ICT competence. To have only one option to participate in a discourse, which is not in your home language and demands using new technology like the Internet, where the lingua franca is English and not an African language, may in fact, exclude individuals from the dominant discourses in the knowledge society. Moreover, the dominant discourse in English, can judge "other discourses", such as those in African languages, as less valuable. Dominant discourses have the capacity to exclude and control what can be spoken of and by whom. This is similar to how van Grasdorff (2004) understands Foucault's analysis of power relations and how the West has been able to influence and shape the world by controlling knowledge production, transmission and dissemination. It is, thus, the power of discourse that can be interpreted by using Foucault's writings to form and construct the society. Despite the liberal South African Constitution from 1994 and the emphasis on equal language rights in the country, the LoLT in the township schools, where you find the majority of black learners, is predominantly English

---

[32] Referring to the overall theoretical framework of the study.

and not the learners' home language. This can indicate what Foucault argues maintains existing power structures. The isiXhosa-speaking learners, and to a certain extent the Afrikaans-speaking learners, have restricted capability to understand and to fully participate in the dominant discourse of English in the classroom as well as in utilizing the curriculum material, software and so forth. This is coherent with how Jardine (2005, p. 12) understands Foucault's marginalized voices.

Foucault maintains that "the problem is not changing people's consciousnesses – or what's in their heads – but the political, economic, institutional regime of the production of truth" (Foucault & Gordon, 1980, p. 133). This author, therefore, argues that discourses build on social categorisation, which again constitutes the social context where the discourses find their place and operate. Discourse can moreover reflect existing struggles as the opportunity to speak and the ability to understand varies highly based on where you are positioned in the social hierarchy.

Foucault's insight to the access to discourse serves as a means to generate consensus on existing order, as discourse can justify and maintain the dominating Westernised discourse on technology and language. This study argues that non-native English speaking learners experience linguistic and literacy obstacles, which can hinder active participation in knowledge construction. Therefore, the statement that the Internet is a source of information and a knowledge base open for all is doubted. Furthermore, the learners in this study can be viewed as Foucault's marginalized voices as they struggle with the discrepancy between the LoLT and their HL. Many of the learners face extra challenges when using ICT in a language that is not their own. This limits learners' and teachers' digital opportunities and influences their active participation in discourse and knowledge construction.

The three concepts in focus – *culture*, *language*, and *power* – all serve as an entry to the discourse on development. Theories on development will serve the purpose of moving the discussion from the scope of the classroom to a wider societal level.

3.4 Theories of development and the concept of development

Development and development theories are closely connected to modernization theory and the underlying assumption that third world countries or 'traditional' societies can 'develop' according to Western paths (Leys, 2005). Development has been linked to GNP per capita or economic measures, efficiency, and lately, to minimum state interventions. Such neo-liberal notions of development and growth have been challenged by traditional Marxist

development theories and critical neo-Marxist thinkers of development. Similarly, as previously mentioned, in the case of ICT implementation and use within the educational system of developing countries, the discourse is often influenced by Western standards and Western ways instead of emphasising the relevance of its adaptation and strengthening local initiatives.

Early development theories include a unidirectional view of development, which should be possible to generalize across cultures and eras. Rostow's (1960) notion of stages of economic growth describes a way for traditional societies to develop by following the same paths as developed countries have earlier. Dependency theories and world system theories (Frank, 1996; Wallerstein, 1979) were meant as a response to the unidirectional thinking of modernist thought. These theories viewed development and underdevelopment from the aspect of dependency, which the developed and wealthy core countries had established. The way for the developing nations to develop was, therefore, primarily found in breaking the dependency link with the developed countries and increasing internal growth (So, 1990). Economic growth-based development was further challenged by alternative approaches focusing on human rights and human capabilities. The dominant approach towards development since the late 1990s has been to view it from poverty alleviation, with an emphasis on reaching international goals such as the UN's Millennium Development Goals (MDGs) (2000) or, more specifically focused on education, the Education for All (EFA) goals (UNESCO, 2000). These goals also indicate development largely in economic terms rather than in cultural or social ones. Klees (2008), for example, questions the effect of these policies and if they are really committed to social progress and development. In its present meaning, the term development is seen as a post-war product highly connected to the expansion of Europe, colonialism and the history and development of industrialized countries (Mair, 1984; Pieterse, 2010; Unwin, 2009).

Tucker (1999) explains the problematic nature of the term development when critiquing the lack of cultural dimension in development thinking. Other work has called for a new paradigm (Nolan, 2002) or a reconstruction of the whole discourse around development (de Sardan, 2005). Escobar (1991) goes as far as arguing that within development anthropology in particular, the discourse is nothing more than recycling the discourses of modernization and development instead of "listening to the voices of different groups of people in the Third World, without making them into signs of a need for development" (Escobar, 1991, p. 671). From the 1970s, there was an attempt to provide alternative approaches based on the traditional development theory by Marx and Hegel,

followed by emphasis on human development (Leys, 2005; Peet & Hartwick, 2009). Considering the value-laden and problematic historical connotation of the term, Tucker (1999) asks whether new values will be imported or imposed in the name of 'development'? Answering this, he distinguishes between the major concern of producing goods and technological efficiency and the concern regarding production of power structures and ideology.

When considering the various approaches and theories of development, they can be criticised for being overtly biased and deterministic. Often the view is ethnocentric, presenting a dualistic view of the world. Therefore, it is important to consider the term development and to whom it is referring. As Harding (1997) argues, when referring to epistemological assumptions around knowledge, Western knowledge is connected to modern science and technology whereas the knowledge from the South[33] is connected to historically unchanging and static traditional knowledge. Western knowledge has dominated the discourse on development and scholars are increasingly seeking alternative perspectives and alternative ways. Peet and Hartwick (2009) argue that development is important as it influences societal and cultural aspects such as life chances, health services, education and so on. Therefore, they view Foucault as an important voice in bringing in an alternative perspective when he writes about, and is critical of, the enlightenment ideas of rationality. However, much is left undone in order to construct theoretical perspectives on development that do justice "to the social imaginary of Third-World peoples without first reconstructing them in our terms before meeting them" (Tucker, 1999, p. 23).

3.4.1 Global and local initiatives on development, education and ICT

The World Summit on the Information Society (WSIS) was initiated following a UN General Assembly resolution in 2001. The objective of the WSIS was to initiate and develop a statement of political will to take action and establish the necessary platform for an information society for all. After the first meeting in Geneva Switzerland, a common vision and guiding principles were presented in what the society refers to as action lines (World Summit on the Information Society, 2003). The objectives, with a *Plan of Action* for all participating countries and representatives, were to:

---

[33] Terms such as developing/developed, first world/third world, Western/non-Western have been replaced with terms such as North/South. Said (2003) connects such dichotomizing language to the classification of us versus the other. No matter which concepts are used, none of them acknowledges the complexities that exist nor the different definitions. Thus I acknowledge the fact that powerful countries/areas are to be found in the South and in the North there are also areas of marginalised and less powerful countries/areas.

> Build an inclusive Information Society; to put the potential of knowledge and ICTs at the service of development; to promote the use of information and knowledge for the achievement of internationally agreed development goals, including those contained in the Millennium Declaration; and to address new challenges of the Information Society, at the national, regional and international levels (WSIS 2003, para B4).

Included in the action lines of the WSIS was a special section on e-learning with focus on capacity building and ICT literacy.[34] Moreover, a particularly interesting and relevant section with regard to this study is the section on cultural diversity and identity, linguistic diversity and local content. [35]

In South Africa educational reforms have been strongly influenced by western educational reforms (Kubow, 2008) such as the so-called Outcomes-Based Education (OBE) initiative.[36] The vast effort put into the OBE implementation during the last years may have caused a certain change fatigue in educators in South Africa, which may later have influenced educators' views on other forms of change and professional development processes typically connected with the West, such as the implementation of ICT. Moreover scholars have started to question the lack of focus on indigenised theory and methodology in the discourse of education in Africa (Breidlid, 2004; Brock-Utne & Lwaitama, 2010; Denzin, Lincoln, & Smith, 2008; Semali, 2009; Smith, 1999).

The use and integration of ICT has the potential to support development. Information and communication for development (ICT4D) and information and communication for education (ICT4E) originate from traditional development theories. ICT4D is mostly referred to in connection with economic growth and development assumptions based on Western belief systems. This study, however, emphasises a focus on the micro level and adopts a classroom perspective, linking it to a macro level perspective focusing on prosperity and societal aspects. It argues that, within the field of ICT in

---

[34] See section C4 in the action plan. Note that the terms e-learning and ICT literacy are the terms used in the WSIS´s plan of action.

[35] Section C8.

[36] The OBE initiative was introduced through the Curriculum 2005 reform (Botha, 2002). It built largely on similar reforms from Australia, New Zealand, Scotland, Canada and USA and was seen as the system most capable of addressing the inequalities on different levels within the South African education system (Cross, Mungadi, & Rouhani, 2002). As Botha argues, "Curriculum 2005 and the OBE model presents a unique opportunity for systematic change and the improvement of quality in South African education" (Botha, 2002, p. 13). The reform was highly learner-centred and represented a shift from content-driven to outcome-driven curriculum (Soudien & Baxen, 1997). However, critics disputed the origins of the policy and pointed out its poor connection to local communities and the everyday work experience and work load of educators (Breidlid, 2002, 2004; Cross et al., 2002; Jansen & Christie, 1999; Soudien & Baxen, 1997).

education, greater focus is needed on localisation and the influence of language and other cultural aspects in ICT integration. Therefore, instead of asking questions such as, "is there computer access and how many computers are available?", questions that are more appropriate are; "how are computers used and what power structures shape learners' access and use within school and outside of school?"

When Unwin (2009) claims that ICT has the potential to influence the lives of disadvantaged people and transform their livelihoods, the focus is not on the actual technology itself. It is argued, in coherence with ICT4D, that an alternative approach is needed, which focuses on development from below as opposed to top down approaches. Local initiatives and sustainability of technology are central. By exploring computer use in a stratified educational system such as in South Africa, ICT use aims towards making teaching and learning more meaningful, supporting development, and empowering both learners and educators. Therefore, ICT is viewed in the context of how it represents knowledge and capabilities in the classroom, and as such, it can be linked to a capabilities approach to development.

3.5 Alternative ways of development - The capability approach

One of the early critiques of the notion of income connected to development is found in the capability approach of Amartya Sen (Saito, 2003; Sen, 1992, 1997, 1999a, 1999b). Sen argues for an alternative view on development from a human capability approach, which views development as enabling or empowering (Pieterse, 2010) and consists of a different measure of human well being and quality of life. Routed in an Aristotelian understanding of a good life, Sen argues that the goal of development should be to expand choice or freedom people enjoy through capabilities and functionings (Sen, 1992). Capabilities refer to the ability to achieve, whereas functionings are achievements and the foundations of a person's well being. The functionings vary from the most elementary ones of getting nourishment, to the more complex ones of having self respect or of being able to participate in community decisions (Sen, 1992, 1999b). Sen refers to development as expanding freedoms (Sen, 1999b) and argues that development is, therefore, based on increasing people's capabilities and opportunities. These will again boost the freedom individuals have to lead their lives in the way they choose.

Applying this approach in the study on ICT in South African classrooms directs the focus on the capabilities of learners and ways that ICT competence can increase their

opportunities regarding further education, employment, and general well-being. ICT competence can increase individual freedoms and opportunities or, on the contrary, the lack of ICT competence can exacerbate the digital divide between those having the necessary ICT competence and those without, as referred to in papers III and IV. By applying Sen's approach this author argues away from the previous emphasis on material access towards increased emphasis on ICT competence, learner opportunities, and adequate training of teachers. As Britz (2004, p. 199) argues, it is furthermore important "to ensure that each individual in a community has an equal opportunity, not only to gain access to essential information, but also receive education in order to benefit from information". Many would argue that ICT competence is central for learners' educational opportunities, but the way the learners utilise their capabilities is influenced by conditions at home and in school. Accordingly, the significance of out of school access on learners' ICT competence is explored in paper IV. Furthermore, individual differences influence peoples' skills, capabilities and freedoms when using ICT (Alampay, 2006; Robeyns, 2005).

Unterhalter and Brighouse (2010) highlight the instrumental, intrinsic and positional value of education in line with Sen's ideas. The instrumental value of education relates to traditional schooling and how education increases job opportunities and promotes learners' political and social participation. It is further supported with adequate resources, teachers' qualifications and it can be measured in test scores. The intrinsic value, however, indicates the benefits beyond instrumental factors. The intrinsic value leads to increased well being of the learner such as being able to enjoy classical music or improve one's self confidence. The positional value refers to how education has benefitted the individual in relation to others who have the same level of education but a different background in terms of class, gender, or ethnicity, for example. The concept of positional value is evidently important in a country such as South Africa, where inequalities are often overlooked and not sufficiently addressed when educational policies or reforms are put into practice. These three values of education are overlapping and all contribute to learners' well being and freedom (Sen, 1999a). CA, therefore, allows a wide focus, unlike the traditional method of perceiving the information society and development merely through a focus on growth in infrastructure, number of internet hosts, tele-density and so on (Alampay, 2006). Zheng (2009) similarly agrees that when applying the CA approach to ICT in a development context, users are not perceived as passive receivers in economic progress but rather influenced by the needs and expectations in the users' social, cultural, and historical environment. Sen (2003) therefore argues away from economic commodities, similar to what Marx called commodity fetishism in his

writings on capital, and explains that the most elementary choices within education are connected to deprivation and insecurity

> The elementary fact [is] that illiteracy and innumeracy are forms of insecurity in themselves. The inability to read or write or count or communicate is a tremendous deprivation. The extreme case of insecurity is the certainty of deprivation, and the absence of any chance of avoiding that fate (Sen, 2003, para. 5).

The inability to develop reading and writing skills is a deprivation of a learner's individual capabilities as is the lack of acquiring ICT competence. Critical studies on ICT4D have, however, indicated that it is difficult to achieve a significant relationship between ICT integration and development. Consequently, many ICT projects have failed or only had a short-term effect on computer use in developing countries, which indicates that they rarely drive any social or economic development for those involved. While recognizing that knowledge is socially constructed, historically situated, and culturally mediated, the ways in which ICT implementation and use can improve people's opportunities and freedoms are of importance. In papers II-IV, the relevance divide, which includes relevant use and content is emphasised.

Sen's CA relates to the overall critical theory framework in this study by emphasizing development, yet omitting the traditional economic focus and adding a human dimension to ICT integration. The CA embraces emphasis on the human dimension in studies on ICT4E, which includes the cultural aspect and further focus on capabilities and functioning. Selwyn and Facer (2010, p. 11) argue "in a reflexive, globalised society where individuals are expected to take responsibility for their own actions, this is arguably the most important aspect of the digital divide". Enhancing choices and increasing freedoms also include the choice of the language learners' use when applying ICT.

Implicit in the discussion above is the understanding that the digital divide is strongly connected to the different aspects or values of education: the instrumental, the intrinsic, and the positional. Through poverty reduction strategies, developing countries are increasingly connecting development to education and ICT (GESCI, 2010; Swarts, n.y.) and international development agreements also combine the two. This is where perspectives from critical theories relate to the study. Critical theories question in general the status quo, which serves the powerful rather than the marginalised. They place emphasis on justice and

equity within education and encourage social change, which also is the potential of transformative ICT use in the classroom.

3.6 Critical approaches

Critical theories[37] are interpretive approaches that critically view the world as socially and historically embedded. The social world consists of power imbalances at all levels, and there is a strong emphasis on change and the possibility of transformation. The roots of critical theories have often been traced to the Frankfurt school of thought in Germany, with key scholars such as Horkheimer, Adorno, Fromm, Marcuse, Benjamin, Pollock and later Habermas (Alvesson & Sköldberg, 2000, 2008; Held, 1980).

Critical theories can be viewed as meta-theoretical, having an abstract approach with a somewhat challenging link to empirical research. However, "[c]ritical theory can offset the innate tendency of empirical research to provide seemingly neutral descriptions of that which exists, and the reproduction of taken-for-granted institutionalized relationships of domination" (Alvesson & Sköldberg, 2000, p. 111). Furthermore, critical theories offer approaches that include social contexts as well as historical, political, and ideological practises in the field of social research (Harvey, 1990; Hoy & McCarthy, 1994). Thus educational systems can be seen as reinforcing class advantage and social control (Morrow & Torres, 1995). Therefore, this author argues that, with its distinct emphasis on self-examination and reflection and the social embeddings of research, critical theories serve as an appropriate theoretical overall framework when researching culturally and historically complex South Africa. However it should be emphasised that critical theories entail several different ways of viewing the world and cannot be referred to as one single approach.

The common feature uniting these theories, however, is the acknowledgment of the inevitable connection between power structures and knowledge (see further section 3.3 and 3.3.1). Critical theories take a stance away from positivism and the view that scientific knowledge can be objective (Smyth & Shacklock, 1998). Habermas, for instance, considers the self-reflection of the researcher when he argues that it is only by self-reflection that we become aware of emancipatory actions (Habermas, 1987). Similarly, Foucault makes an interesting contribution to our understanding of the link between knowledge and power in his selected writings (Foucault, 1972; Foucault & Gordon, 1980).[38]

---

[37] Critical theories will be addressed in plural, which indicates multiple approaches and various emphases.
[38] See further section 3.3.1.

Critical theories furthermore interrogate the nature and structure of the social world through the concept of power. In addition to trying to understand its nature, it emphasises change and makes the social world more humane, equitable, and just (Tripp, 1998; Ward, 2010). In that respect, critical theories could be viewed as normative[39] theories that are preoccupied with values and what ought to be. Nevertheless, according to Morrow and Brown (1994, p. 11), critical theories should rather be viewed as an "utopian imagination" and a critique of existing norms and values.

3.6.1 Critical education theories

Critical education theories are a subset of critical theories with focus on education in particular. Critical education theories build on the same foundations as critical theories and they also consist of a wide variety of theoretical approaches with many different aspects and adherents (McLaren, 2009).[40] Selwyn argues that by using critical theories on technology in education, the focus moves to the social construction of technology and how external economic, political, social, and cultural factors influence the use of technology (Selwyn, 2007).

Whereas education did not play a central role for the core members of the Frankfurt school in the late 1930s, both Adorno and Horkheimer did, on several occasions, raise the issue of how critical theories could be applied to pedagogy and the sociology of education (Morrow & Torres, 1995). It was not until the 1970s that critical theories became more apparent and somewhat influential within educational discourse, with writings of scholars such as Illich, Habermas, Bowles, Gintis, and, a decade later, the work of Giroux and Apple. Many believe that the single most important influence of critical education theories is within action research or participatory action research (Kemmis, 2006; Kemmis & McTaggart, 2005; Morrow & Torres, 1995). Critical theories have widely criticised positivist approaches, and as Carr and Kemmis (1986) enter the debate, they emphasise the need for

---

[39] Before continuing, a note on the normative standpoint of critical theories and development theories in general (including ICT4D & ICT4E) is needed. Theories such as these can be considered problematic due to their normative "should be" emphasis. It is, however, difficult to view education in a vacuum of highly influential political agreements locally and globally and education can hardly be considered as a neutral activity in any aspect of the word. Walker and Unterhalter (2007, p. 15) claim that education "always embodies a view about what is good in human life". Otherwise education becomes meaningless and insignificant. This is the standpoint taken in the study.

[40] Whereas critical education theories are concerned with the interconnectedness of knowledge and power for example, critical pedagogy is rather a teaching approach, which challenges subordination and encourages emancipating practises within the classroom.

an adequate approach to educational theory based on five requirements, claiming that educational theory must accomplish the following:

1. Reject positivist notions of rationality, objectivity, and truth.
2. Accept the need to employ the interpretive categories of teachers.
3. Provide ways of distinguishing ideologically distorted interpretations from those that are not and provide some view of how any distorted self-understanding is to be overcome.
4. Be concerned with identifying and exposing those aspects of the existing social order that frustrate the pursuit of rational goals and be able to offer theoretical accounts that inform teachers of how these aspects may be eliminated or overcome.
5. Recognize that educational theory is practical, in the sense that the question of its educational status will be determined by the ways in which it relates to practice (Carr & Kemmis, 1986, pp. 129-130).

Whereas Carr and Kemmis reject the positivist understanding of objectivity and focus on the practise-oriented theory, Patton states that objectivity and subjectivity have become "ideological ammunition in the paradigms debate" (Patton, 1990, p. 55). Agreeing with Patton's approach of avoiding both terms and rather preferring to use "empathic neutrality", it refers to credible research design where the researcher attempts to be "true to complexities and multiple perspectives as they emerge" instead of claiming either objective "value free" science or subjective research, which lacks credibility (Patton, 1990, p. 55). Paper I is written within this tradition (Gudmundsdottir & Brock-Utne, 2010).

Despite the different approaches found within critical education theories, there are also several key concepts that are evident in much of the work done within critical theories in general, as well as critical education theories in particular. These are related to the common view that people are "unfree and inhabit a world rife with contradictions and asymmetries of power and privilege" (McLaren, 2009, p. 61). Critical education theories put the term power in focus within educational systems as they strive to re-evaluate the relationship between theory and practise. As such, the asymmetries of power and inequalities in society affect the choices made by policy makers, approaches used in the classroom and general discourse on educational issues. Examining education and activities within the classroom through exposing power relations and causes of alienation and domination is, therefore, of importance.

When viewing, in particular, the use of ICT in education through the lens of critical education theories, the principle of encouraging social change and questioning current practises of implementation and use of ICT is fundamental. Underlying questions that have

guided this study are, for example, how classroom practises are shaped by the social, political, and economic forces outside the classroom in relation to what is taught, and how it is taught.

Using critical theoretical perspectives in research on ICT provides opportunities to shape critical epistemology. Howcroft and Trauth put forth five themes that are particularly relevant for this purpose but stress that these are not definitive or exhaustive. The five themes include emphasis on:

1. *Emancipation* **-** making individuals more conscious of power relations and freeing them from domination.
2. *Critique of tradition* **-** providing alternatives and different approaches towards technological imperatives. The emphasis is on positive change and eliminating the status quo, by questioning the societal consensus of power connected to organizational activities [including within educational institutions] to a wider context.
3. *Non-performative intent* **-** rejecting the provision of ICT tools to support and assist managerial efficiency and the mere focus on increased efficiency and maximum output.
4. *Critique of technological determinism* **-** placing technological development in a broader context of social and economic changes instead of assuming that societal development is determined by technology.
5. *Reflexivity* **-** assuming a methodological approach and the conscious role of researcher critiquing the objectivity of research, the choice of research topic, and how research is conducted (Howcroft & Trauth, 2005, pp. 2-5).

All of the above have a direct connection to classroom practises and the role of the researcher in educational research. In the context of this study, the five themes help move the focus beyond material access and computer use based on economic efficiency. Instead, the study provides a critical framework on current practises, focusing on the human and cultural aspects of ICT integration and use in the classroom by categorising learners' ICT competence according to the location of school, ethnicity, and home language.

Referring to emancipation above, it includes empowering disadvantaged learners to become conscious of their situations by providing different alternatives and positive changes towards development and increased awareness. The emphasis on effectiveness and managerial issues is put aside when criticising technological determinism, including the belief that ICT alone can bring people out of poverty, make schools better, increase teacher efficiency, and inspire automatic learning benefits (Bonk, 2009; Scheuermann & Francesc, 2009; Watson, 2006). The self-reflexivity of the researcher is also a part of the emphasis on social change and awareness (see further section 4.2.2).

Based on the discussion in this chapter, the theoretical approach may be linked to a certain paradigmatic approach. A paradigm is a philosophical framework or a belief system connected to axiological and epistemological assumptions of the theories involved in research (Mertens, Bledsoe, Sullivan, & Wilson, 2010). A short presentation of the paradigm is included in the following section.

3.6.2 The transformative paradigm

Guba and Lincoln (2005) make a distinction between different paradigms or belief systems connected to research. These are positivism, post-positivism, constructivism, critical theory and the participatory paradigm. The present study is linked to the critical theory paradigm with its emphasis on concepts such as power, culture, diversity, social justice and change (Guba & Lincoln, 2005).

Mertens et al. (2010) claim that the transformative paradigm[41] arose due to initiatives taken by researchers and marginalized groups who were discontent with the emphasis within present research traditions. Hatch (2002) refers to transformative methods within the critical paradigm when explaining how raising consciousness is the base for social change. Therefore, the transformative paradigm has been perceived within several research areas and it has aspects in common with feminist research, indigenous and ethnicity/race research as well as with research on disabilities. The axiological assumptions of the transformative paradigm focus on power imbalance and ethical implications, which follow subordination and discrimination, all of which has been part of previous discussions on the South African society.

The transformative paradigm is based on ontological assumptions that are based on historical realism, recognising socially constructed reality shaped by different factors such as social, political, economic, cultural, gender and ethnic values (Guba & Lincoln, 2005; Mertens et al., 2010). The paradigm has a direct link to critical theory approaches and calls for social action, transformation, and change. It is thus in stark contrast to the more positivistic realm, viewing reality as absolute. The incompatible emphasis between the

---

[41] Guba and Lincoln (2005) do not use the term transformative paradigm in their paradigmatic analysis but use "critical theories" as a heading. When asked why collapsing paradigms with theories they explain that paradigms and theories are commensurate and do not violate each other in ontological, methodological and axiological understanding (as cited in Mertens et al., 2010, pp. 194-195). I however prefer using the term transformative paradigm as it better characterises the emphasis within this research tradition.

different paradigms is questioned especially by those applying mixed methods, which will be discussed further in Chapter 4.

3.7 Conclusion

This chapter has sought to give an overview of the theoretical aspects influencing the study. The focus has been on critical education theories, theories of development, and the capability approach in order to extend the discussion on the digital divide. This indicates moving away from the economic aspects of development and measuring access in numbers of computers towards including the social surroundings of the learners. Combining perspectives of critical theories on technology (see section 3.5.1) with theories of development relates to the focus of the relevance divide within the cumulative model of the digital divide (see *Figure 4*). The discussion has further connections to Foucault's critical discussion on knowledge and power and to the field of ICT4D and ICT4E.

Whereas the paradigmatic focus, which characterises the papers in the study (see Part II), is found within the transformative paradigm, the individual papers do not include a specific account of critical theories. The role of critical theories can be viewed as being the theoretical backbone within the transformative paradigm, which serves as an amalgamation of the theoretical discussion in the papers. Acknowledging the transformative paradigm has furthermore influenced ontological and epistemological assumptions, the theoretical focus, as well as the methodological approach, which will be explored in the following chapter.

4.0 Method

The purpose of this chapter is to introduce the methodological approach used in the study and to explain how this relates to the underlying paradigm, data collection, and analysis. The role of the researcher, as well as limitations and future research, will be explored, alongside the term validity, and the relationship to quality in a study using a mixed method design.

4.1 The transformative paradigm and mixed method design

The mixed method approach relies on a continuum of underlying paradigms (Niglas, Kaipainen & Kippar, 2008). A paradigm was originally defined as a belief system by Kuhn (1996) in 1962.[42] Focusing on how the transformative paradigm integrates with the mixed method design, the paradigmatic approach, which Guba and Lincoln (2005) introduce can be seen as too rigid in connection with mixed methods. In Guba's and Lincoln's upgraded edition of their paradigmatic discussion they, however, recognise that the boundaries are blurred and not absolute (Guba & Lincoln, 2005). Additionally Niglas et al. (2008) argue for a "soft ontological approach", which offers a mediating role within multiple perspectives on the realities considered within the mixed method design.

　　　The stark contrast between qualitative and quantitative methods with regard to ontological and epistemological assumptions can result in a "strangely schizophrenic position" of researchers and practitioners of mixed methods (Bergman, 2008, p. 14). In order to use mixed methods effectively and not to be encumbered by the belief systems of the two divisional models of qualitative or quantitative approaches, reconceptualising is necessary. Such reconceptualising includes an emphasis on research questions, research focus, context, and theoretical grounding rather than on the strict division between the two approaches and their underlying paradigms. True to the transformative paradigm, the present study applies an understanding of constructed reality, which is historically and socially situated. The following section will further explain the mixed method design, including how the different data of this study are categorized into main and supplementary data fields.

---

[42] The original publication of *The Structure of Scientific Revolutions* is from 1962.

4.2 Design

The mixed method model combines the strengths of both the qualitative and quantitative approaches and gives a holistic account of the use of ICT. Consequently, a mixed method model includes a denial of the incompatibility thesis, which claims that using both qualitative and quantitative methods and analysis is not possible (Teddlie & Tashakkori, 2009). Wilson (2004, p. 106) argues that doing a comparative study implies that the researcher is obliged to make a choice: to go either "wide" or "deep". A mixed method model can, however, serve as a compromise between the two, as qualitative data are most often connected with the depth and "thick description" (Geertz, 1977), whereas the quantitative approach is often viewed as the wide approach reaching many participants.

Mixed method design within the transformative paradigm is valued for its flexibility in being able to incorporate methods, which emphasise social justice, social change, empowerment, and inclusiveness. It is, however, criticized by Denzin and Lincoln (2005) for resulting in a methodological hierarchy, as quantitative methods are placed at the top and the active participation of stakeholders is neglected by both the researcher and the participants. Teddlie and Tashakkori (2009) answer this critique carefully and point out several studies which, on the contrary, place qualitative methods in the forefront and facilitate active participation, which applies to this study.

The mixed method design has gained increased influence, partly because it has been put through an ideological debate. When methods are used, based on different belief systems, as described in the previous chapter, they require an elaborated explanation. Bryman (2006) has completed a comprehensive meta-analysis on studies using mixed methods and the typologies to which these apply. Arguing for the reasons behind the choice of mixed methods is manifold but the most common ones are a) to seek enhancement, b) to seek completeness, c) to strengthen the triangulation process, and d) to serve the sampling purposes (Bryman, 2006). The following reasons explain the choice of a mixed method model for data collection and analysis in this study:

a) *Context*. The complexity of South Africa as a case, with its recent history of apartheid and its cultural diversity, calls for an in-depth contextual understanding of the apartheid legacy and its integration in research methods and approaches.
b) *Previous emphasis*. Many previous studies on the digital divide primarily use quantitative methods without the contextual understanding allowed by qualitative methods.

c) *Language challenges.* Due to possible language challenges occurring during the interviews, a quantitative questionnaire in the different home languages would catch those learners who would not be able to express themselves in English.

d) *Identification.* The study identifies possible different (unknown) factors influencing the digital divide.

e) *Triangulation purposes.* Triangulation increases the validity of the research by converging and crosschecking the qualitative data with numeric trends of the quantitative data.

f) *Audience.* There is a need to reach a policy audience by providing findings based on a variety of methods.

g) *Validity.* Suggesting change and policy emphasis needs research findings with high validity in order to present legitimate and applicable answers to the research question.

h) *Interest*. The researcher's prior training and interest in approaching the topic from different angles and combining the flexibility of qualitative inquiry with a more structured form of quantitative research enhances the validity of the data.

Having clarified the main reasons for the use of the mixed method design in the study, the following section explains the characteristics of the design.

4.2.1 Concurrent mixed method design

Morse (2010) categorizes mixed methods into simultaneous and sequential mixed method design with core and supplementary components. Tashakkori and Teddlie (1998, pp. 44-46) call this a dominant-less dominant mixed method design and it is often used within fields that have a strong tradition within either qualitative or quantitative research methods (Tashakkori & Teddlie, 1998). In the case of this study, the qualitative data are core data (dominant) and the quantitative data are supplementary (less dominant). According to Morse's categorization (2010) the QUAL+quan design applies to this study.

Yet another typology used for the mixed method design can be found in Creswell (2009), when he makes a distinction between the concurrent mixed method and the transformative mixed method design relating to incorporating a theoretical dimension into the method design. When transferred to the mixed method model used in this study, it is a merged model of these two (Creswell, 2009; Tashakkori & Teddlie, 1998), as the concurrent mixed method is supported by the transformative paradigm and by critical theories.

Mixed method models differ in combination. They can be either concurrent (parallel) or sequential (Creswell & Plano Clark, 2008; Teddlie & Tashakkori, 2009). The concurrent design makes use of different methods simultaneously, or in overlapping fashion, whereas the sequential model uses one method at a time. In *Figure 6* the design used in this study is

revealed. Phase 1 relates to the piloting period and phase 2 relates to the main fieldwork. The model further shows methods used for data collection as well as procedures, sample size, and materials (products) used for the analysis.

4.2.2 Reflexivity

Within the theoretical framework used here, the focus is on the importance of the context in which the data are gathered, what Alvesson and Sköldberg (2000) have called critical emancipation-driven research. Furthermore, the theoretical approach of the study allows for the reflexivity of the researcher and participants, quite the opposite of the positivist perception that research should be neutral by nature. The words of Paulo Freire (1998) reflect this notion: "I am not impartial or objective; not a fixed observer of facts and happenings". Reflexivity within social research is thus, generally speaking, "the ways in which the products of research are affected by the personnel and process of doing research" (Davies, 2008, p. 4). Within the stand of critical research and the transformative paradigm, power relations at all levels are important to consider. This also includes the positioning of the researcher within the research and the influences that positioning has on the whole process of data collection. All choices made, from deciding on a research theme to the final findings of a research project are influenced by multiple variables connected to the researcher and the participants (Cohen, Morrison, & Manion, 2007). As Shacklock and Smyth (1998, p. 7) argue:

> The process of reflexivity is an attempt to identify, do something about, and acknowledge the limitations of the research: its location, its subjects, its process, its theoretical context, its data, its analysis, and how accounts recognize that the construction of knowledge takes place in the world and not apart from it.

This study had to take into account that this researcher was not only a foreigner but also white, English-speaking and female. These categories provide a certain positioning within South Africa and can influence access and findings from the field. Moreover, there are certain challenges in conducting research in a foreign country or in a situation unfamiliar to the researcher. The accessibility to the field site as well as the understanding of the contextual framework can be a challenge when being an outsider.

Figure 6. The concurrent mixed method design used in the study.

PHASE 1

Quan
Data collection

Procedures:
Structured questionnaire
(N = 91)

Products:
Numerical data. Categories developed and new ones identified. Challenges and weaknesses identified.

QUAL
Data collection

Procedures:
Semi-structured interviews with learners (n = 34), teachers, principals and others (N = 19). Classroom observation.

Products:
34 recorded hours of interviews. Field notes and reflections from informal interviews. Field notes from classroom observations.

QUAL
Data analysis

Procedures:
Content analysis. Coding themes. Identifying emerging themes from transcribed interviews and field notes from classroom observations.

Products:
Categories identified from transcribed interviews. Attitudes and reflections on computer use, the language issue and ICT implementation.

PHASE 2

Quan
Data collection

Procedures:
Structured questionnaire for learners
(N = 290)

Products:
Statistical analysis.

Quan
Data analysis

Procedures:
Descriptive statistics, frequencies, means, ANOVA, Chi Square.

Products:
Access, frequency and location of use. ICT competence and skills. Home use vs. school use.

Findings
Compare and merge QUAL and quan findings

Products:
Categories of qualitative responses on ICT skills and attitudes compared and cross-checked with statistical results. Discussion in Part I of this dissertation linking together the papers.

55

Being a part of the LOITASA network, which includes researchers from the University of the Western Cape, did have a positive effect on the credibility of the project, both when applying for a research permit from the educational authorities and when gaining access to the participating schools.

During the fieldwork, I often informally discussed the use of ICT and the language issue with the teachers. These discussions influenced questions on use and skills of learners in the questionnaire and added to an understanding of the complex relationship between class, ethnicity, and status. The unsettling question in one of the schools during the first visit was a direct question from the principal who asked, "what is in it for us?" In other words, why should we welcome you and assist you to get your research done if it does not have direct benefits for us and our learners? This is an understandable question, which was not easy to answer at the time. The question, however, stayed in mind throughout the fieldwork and increased both my humbleness and appreciation of the informants. To be allowed to get a glimpse into their lives and their school day was unique. The principal's question also confirmed the theoretical position of the researcher and the importance of doing solid work when writing up the findings. Accordingly, this study has been able to identify aspects of change and improvement, which can benefit the disadvantaged learners within the framework of ICT integration and use, and ultimately, give something to the school and the learners in turn.

4.3 School selection and site information

South Africa is a multi-cultural nation with various different ethnic groups that do not share the same cultural, historical, economic, and social backgrounds. South Africa is a middle-income country with a US$ 2,809 per capita gross national product (for the year 2000). However, the inequality in the country is among the highest in the world (UNDP, 2000). Deegan (2001) states that the uneven development in South Africa under apartheid has, in reality, produced a first/third world society within the same country. Makhaya and Roberts (2003) agree, when arguing that one of the main reasons for low economic growth in South Africa is found in the history of apartheid and its influences.

The data gathering took place in Cape Town in the Western Cape Province. The South Africa statistics web (Statistics South Africa, 2008) estimated the inhabitants of the Western Cape to be roughly 5.3 million in 2007. According to the South African census from 2001, the division between the population groups in the Western Cape was as follows:

Table 4. *Population groups in the Western Cape province according to Census 2001*
(Statistics South Africa, 2001, p. 5).

African/Black	Coloured	Indian/Asian	White
1,207,429	2,438,974	45,032	832,901
27%	54%	1%	18%

Moreover, there are 11 official languages in South Africa; nine are African languages and the other two are English and Afrikaans. The status of these languages has been and still is uneven and the language discourse in the country is highly political and value laden. Moreover, the nine African languages are the former Bantustan languages, which refer to the black African homelands defined by whites as a part of apartheid. Makelela (2005) has criticised the distinction and declares that it denigrates the African languages. Moreover, he suggests that it would be beneficial for the black population to harmonize the African languages into two groups: seSotho and isiNguni. African learners would be ensured of learning in an African language and the status of English would be curtailed at the same time, as the African languages would gain more significance.

The sample in this study consists of four schools in Cape Town. Three of the schools were participating in the Khanya ICT initiative conducted by educational authorities in the Western Cape. The aim of the Khanya initiative is to provide all the approximately 1500 public schools in the province with a teaching and learning environment supported by computers and ICT. Additionally, I visited one former white school[43] at a late stage in the fieldwork. The seventh grade learners in that school answered the same questionnaire as the learners in the other three schools, but did not participate in the interview procedures and were only observed during computer sessions for a short time.[44]

The participating learners were all in grade seven. The seventh grade learners are a more suitable age group when it comes to communication and reflection than younger learners. I was also mindful of the high drop-out rate, particularly with regard to black learners in higher grades (Abdi, 2001; Fataar, 1998). Therefore, choosing older learners might not have provided such an inclusive sample. The EFA assessment report for South

---

[43] Ex-Model C school.
[44] The former white school was included in the sample late in the process. It was added for comparative purposes and in order to learn about the range of ICT use. The main emphasis of the study was, however, to focus on the disadvantaged learners. For this reason, and also due to time limits, no qualitative interviews were conducted in the former white school.

Africa, shows the drop-out rate for black learners aged 6–14 as 17.3% in comparison to whites at 9.3% or Indians at 4.5% of the school-going population in this age range (Department of Education, 2000, p. 37). In addition, research conducted in 2007 by the South African Social Surveys and the University of the Witwatersrand's Centre for Applied Legal Studies shows that black children were six times more likely to repeat a grade than white children (Blaine, 2010). The report also reveals that over half of the school children in compulsory education had repeated at least one year of schooling and half of the school children were, therefore, older than their allotted school grade indicated (Blaine, 2010). Somewhat more than half of black learners who start in grade one have finished grade six twelve years later. The same statistics for white learners show, however, that 96% of them have finished grade six in eight years (Motala, 1995).

The three schools, which are a part of the Khanya initiative and which participated in the study, have certain things in common, but differ with regard to the LoLT. However, this does not mean that there are only learners that have English as their home language in the first school, the "English school" Eaglewood,[45] where English is the LoLT from grade one upwards. Similarly, in the second school, the "Afrikaans school" Acadia, there are not only learners that have Afrikaans as their home language. The language profile of the schools is somewhat more complicated than this. The third school, Xolani primary, as well as Acadia primary, are, for example, dual-medium schools and have classes in both English and isiXhosa or English and Afrikaans. In Freewill, the fourth school, the majority of the learners were white and the LoLT was English. As such, the sample schools reflect the diverse cultural and linguistic background of the learners in Cape Town. An overview from paper III (Gudmundsdottir, 2010b, p. 180) can be used for clarification purposes. It gives an overview of the schools, number of learners, number of seventh grade learners, their home languages, the LoLTs, and the annual school fees.

4.3.1 Eaglewood primary school

The school is located in a small fishing village in the southern suburbs and outskirts of Cape Town. The school has a long history within the community and most of the learners come from neighbouring townships and a coloured settlement, which was established after forced

---

[45] All the names for schools and participants are pseudonyms.

removals from the area during apartheid. Many of the learners[46] choose to come to this school instead of going to the community school, which is closer to their homes and teaches in their home language. Mda (2004) points out that many black parents fear the lack of socio-economic mobility if their children are taught in their home language. In addition, Mda (2004, p. 184) describes the fear of many English and Afrikaans speaking parents about the future of their languages maintaining that "the implications that integration and multilingualism in schools may have for their children, play a major role in the marginalisation of African languages and their use as languages of learning".

Eaglewood is a small school and had 260 learners from grade one to grade seven in 2007. There was one class in each grade and grade seven had 35 learners. Over half of the learners in the school had English as their home language, but 103 learners had isiXhosa as their home language. In grade seven, 10 learners answered that they had English as their home language whereas 16 said it was isiXhosa and 2 Afrikaans. The annual school fees at the school were 650 Rand and approximately 70% of the learners paid the fee; the rest contributed with only part of the amount.[47]

In Eaglewood, the software used at the school was all in English. Learners had more time in the computer room in this school compared to the other schools and the learners were invited to use the computer room during breaks to pursue their own interests. The school had a designated computer teacher who was in charge of the computer room. He took all classes into the room once a week for sessions, which are integrated into whatever the learners had on the syllabus that particular week. In addition to the Khanya package,[48] the school subscribed to educational software from Computers4kids (2011). The class teachers accompanied the learners into the computer room for mathematics and the use of Cami

---

[46] It is more often than not the parents' choice to send their child to a school with English LoLT. For a revealing discussion see for example Nomlomo (2006) and Soudien (2004).

[47] The school fees in the Western Cape and between provinces vary quite a lot. According to the Education Labour Relations Council (2005), the average annual school fees in the Western Cape in 2005 were 800 Rand. The amount of school fees is an indicator of the socio-economic status of the learners/parents. Thus it can be argued that economic apartheid as opposed to ideological apartheid is becoming more visual. The school fees in the poorer provinces in South Africa (Eastern Cape, Kwa-Zulu-Natal and Mpumulanga) averaged 150 Rand. In Eaglewood the principal told me that many of the learners cannot pay the full amount of school fees which are considerably higher than in the non fee township schools (the local schools). Their families try to contribute as much as they can by paying part of the school fees.

[48] In the standard package for primary schools Khanya provided in 2007 are CAMI (Maths/Perceptual/Diagnostic/Reader), Literacy Bank (Blue/Green/Brown), Circus 1, 2 & 3, Rubricate, Fifi & Fritz, Microsoft Office and Encarta. Optional is Clicker, Inspirations (personal communication with A. Anjari 20. April 2007). The three Khanya schools do not have access to all of this software. Xolani primary, for example, did not have CAMI up and running for a long time due to costly license fees. After the first year of Khanya setting up a computer room, the school is responsible for the maintenance of licenses. The CAMI license was around 2800R in 2007 for one year license.

maths. The learners used many different programmes and were by far the most computer competent of all the learners observed in the three schools.

4.3.2 Xolani primary school

The school is located in one of the oldest black townships in Cape Town. As such, it is well established and considered as relatively safe. Nevertheless, many of the learners come from a poor background and live under difficult situations, often with various social problems at home. The majority of the learners have isiXhosa as their home language.[49] There were two grade seven classes in the school, each with 49 learners and there were 24 computers in the computer room. The school is a non-fee school.

In Xolani, the computer use in grade seven was organised through Cami maths with occasional assignments using Microsoft Word. The class used the Internet in only one lesson during the observations of a six-months fieldwork period. There was no software on the school server in isiXhosa. Moreover, learners had to share computers due to the size of the classes. The learners were able to log on to the computers without problems and execute basic operations on the computers, but it took time, as they typed slowly and made linguistic errors in English, a language, which they understood poorly. The use of software and programmes was limited and most of the teachers at the school did not have access to computers outside the school premises nor did the majority of the learners.

4.3.3 Acadia primary school

The school is located in the eastern part of Cape Town, a predominantly coloured area. Until approximately ten years ago, it was a solely Afrikaans school, but with growing demand from parents for the LoLT to be English, the majority of its classes are now taught in English. Thus, in grade seven there were two classes with English as the LoLT and another class that had Afrikaans as the LoLT. The school hosted 839 learners in 2007, and additionally, 87 learners were in grade R.[50] In the three grade seven classes, there were 103 learners in total. The school had a seven day timetable, which meant that every seventh school day the learners were supposed to have one math class and one literacy class in the

---

[49] In a questionnaire conducted in connection with this study, 7 of the seventh grade learners said their home language was English even though the official files and interviews with the headmaster revealed that all the learners have isiXhosa as their home language. This may indicate the status of English and the strong desirability to belong to that language group.
[50] The pre-school class.

computer room. The school had annual school fees of 460 Rand, which was slightly more than the neighbouring schools.

In Acadia, the Afrikaans grade seven learners were able to use the Cami maths and the Cami reader software in Afrikaans. The learners in all the three grade seven classes showed competence in using these two programmes. However, they seldom used other software or tried out new programmes or online activities. Their activities in the computer room were teacher centred and the computer room was locked between lessons unavailable to learners.

4.3.4 Freewill primary school

Freewill was included in the sample primarily to get an idea of the situation in a school in one of the more affluent areas of Cape Town, as mentioned earlier. Whereas all the other schools are for the so-called disadvantaged learners, Freewill primary school is located in the middle of a white suburb with predominantly white learners. There were 104 learners divided into four grade seven classes in 2007 and 699 learners in the entire school. The monthly school fees in 2007 were 600 Rand.

In Freewill, every class was assigned to the computer room two times a week and the school had a computer room with 35 computers for the learners and one for the teacher. Additionally, there were two computers in the teachers' staff room. The computer teacher integrated ICT use in the different subjects and the learners worked with different tasks on the computers such as making web pages, presentations, writing reports and newspapers.

4.4 The fieldwork – Procedure and types of data

Ethnographic fieldwork shaped the data collection process. According to Patton (1990), fieldwork is the central activity for data collection in qualitative studies. Ethnography, on the other hand, integrates the traditional anthropological research method with data gathering methods that are combined with, or built upon, participation and observation over time in a certain group or society. The fieldwork period started in January 2007 and lasted until July of the same year. The piloting phase took place during two weeks in January 2006.

As reported earlier, the data gathering methods consisted of both qualitative and quantitative methods. The data gathering methods were interviews, observations, questionnaires, and document analysis. Additionally, informal discussions took place during

nearly every visit to the schools. Colleagues at the University of the Western Cape and the University of Cape Town were also valuable informants when it came to some of the more general issues regarding education in South Africa and the integration of ICT in education.

4.4.1 Piloting to initiate contact and access

In order to prepare the fieldwork, a two weeks preparatory pilot study was conducted in two seventh grade classrooms in South Africa in January 2006. Findings of the pilot study are discussed in paper I, focusing on the importance of piloting questions and the challenges of gaining access to the field. It proved to be essential to pilot the questions as some of them led to misunderstandings and the overall design was somewhat confusing for the learners. Piloting also sharpened the focus of the study and established contacts with learners and educators in Cape Town who were likely to be willing to participate in the main study.

The pilot study was important, as the field site was unfamiliar to the researcher, and the preparation period gave first-hand experience and initial impressions about the integration of ICT in education in Cape Town schools. Strauss and Corbin (1990) maintain that a researcher's former knowledge gained by his/her own experience in the field of enquiry will help in understanding events and actions better. Due to the cultural diversity of learners in South Africa, the preparatory visit to the field was also useful in the preparation of a relevant and useable research design.

The two schools in the pilot study were identified with the help of colleagues from the University of the Western Cape, who had already established contact through other research projects. One of the piloting schools was located in a township in Cape Town and the other one in the more affluent area in Cape Town. The principals were contacted and asked whether they approved of having one-seventh grade class in their schools answer a preliminary questionnaire. During the visit, informal conversations with learners and teachers also took place.

The findings from the pilot study were used to improve and reflect on the research project in general. It led directly to changes in terms of research questions and research approach. It was decided that the learners and teachers in the participating schools should have some prior experience of ICT use in the school context. The learners should have access to computers at school and be familiar with their use. Secondly, as the pilot study revealed a deep-rooted digital divide between the township school and the former white school, it was decided to narrow the research focus and place the main emphasis on

disadvantaged learners. Finally, due to linguistic challenges during the pilot project, it was considered necessary to include questions on language in the questionnaire and to pay greater attention to the language issue when interviewing the learners. Furthermore, the final questionnaire was translated into the three main languages in the province and an interpreter attended the interview sessions with the isiXhosa-speaking learners in Xolani primary school. The use of a concurrent mixed method design was developed for the data gathering and analysis in order to involve and adapt methods and approaches to the local context of learners in Cape Town and, therefore, to improve the validity of the main study.

4.4.2. Classroom observations

The classroom observations started in early February 2007 after having established contact with the schools. The principals and this researcher developed a visiting schedule together. The times for observations were carefully located and synchronised between the three schools, which was at times difficult, as two of the schools operated with a 5-day timetable whereas the third one operated with a 7-day timetable. In that school, "day 1" was not always a Monday, for example. Each of the three main schools was visited on average one day a week during the computer sessions of the seventh graders.[51]

At the beginning of the observation period, I introduced myself to the classes and explained that I would be spending time with them in the computer room for the next six months, focusing on how they used computers at school. Later there were also questions about their computer use outside of school. At the beginning of every class thereafter, the learners greeted me with the same phrases of "Good morning/afternoon Professor/Miss/ how are you today?" After a ceremonial response that I was indeed fine and asking them how they were themselves, the class could start.

During the observations, the learners were aware of my presence in the classroom in spite of efforts to be unobtrusive while the teacher was explaining or getting the learners started in working on certain assignments. I sat in different places in the classroom, depending on where there was an empty seat. After the learners started working, I noted what they were doing and walked amongst them, observing more closely which programme they were using, how they were using them, and in what language they interacted and so forth.

---

[51] A public service strike hindered visits in Xolani during the last month of the fieldwork. Due to the strike the school was closed down.

During the observation periods, the learners and teachers were observed with the focus being on the way they associated with each other and with the computers. No formal observation sheets were used, but field notes from the observations became one of the data sources used in the analytical process. The field notes provided important information on attitudes, linguistic preferences, and general descriptions of activities and the classroom environment. The notes also documented the general atmosphere from the computer sessions such as loudness, frustrations, and interactions. Numbers of computers in use, numbers of learners, and the general status of the equipment and teaching resources were also noted.

The fieldwork started with observations of classes in the computer room for eight weeks in February and March 2007. After the first couple of weeks, the learners (and teachers) seemed to grow accustomed to my presence. In Xolani, the use of language, which had been in English during lessons,[52] changed, as the sessions gradually became more and more dominated by isiXhosa. During some of the observation periods, I was asked for help or explanations both at Xolani and at Eaglewood and was responsible for a couple of lessons at Eaglewood while the teacher was absent. In general, I tried to become a part of the classroom setting, without intruding on the teaching if not asked specifically to assist.

4.4.3 Questionnaire

In March 2007, the learners were asked to complete a questionnaire. In Freewill, the learners answered the questionnaire in May 2007, as the school was not included in the first phase of the fieldwork. The learners' questionnaire includes 33 questions about skills and the use of ICT, in school and outside of school and about attitudes to ICT, language and the role of ICT in a school context (see appendix 6). The questions were in a closed format and included multiple-choice questions (see for example, Q.11, Q.12) and dichotomous questions, which are simple questions that ask respondents to answer yes or no (see for example, Q.23, Q.26 and Q.27). Moreover, the questionnaire included importance questions, where participants were asked to rate the importance of a particular issue (see for example, Q.29 and Q.31) and rating scale questions (see Q.30). Likert scale questions, which were included in the pilot study, were changed into simpler forms; for example, some

---

[52] Perhaps initially for my benefit or to demonstrate to me as an outsider that they were able to use this language as the LoLT.

became dichotomous questions due to complications that arose in the piloting process (see further paper I).

Originally, the questionnaire was electronically constructed, but due to technological difficulties, it proved to be necessary for the learners to complete it on a paper copy. The technological difficulties arose when the learners in Eaglewood were submitting the online form. The server, placed at the University of Oslo in Norway, did not accept the submission into the database. As the reason for the problem was not obvious to the IT support team and could, therefore, not be solved immediately and easily, I decided, together with the teachers involved, to use paper copies instead.[53] The learners in Eaglewood had, therefore, to complete the form one more time and this time on paper one week later. The use of paper copies increased the registration work, as the answers to the questionnaires were manually typed into Excel, but after the completion of the fieldwork, they were imported into the statistical package for the social sciences (SPSS).

The questionnaire was translated from English into Afrikaans and isiXhosa and the learners could choose which version they wanted to answer i.e. in which language. The pilot project in 2006 piloted the questionnaire (see paper I). Several of the questions had been used in a series of studies from 1998 to 2004[54] in Iceland, mapping the development of computer use and the computer culture in primary and secondary schools in that country (Jakobsdottir, 2008).

A common question when identifying class is to ask for the income of the household, but such information is difficult for 13 year olds to answer. Therefore, the main occupation of parent/guardian was chosen as an alternative. It proved however, to be problematic, and many of the learners were not able to provide an answer or were very unsure how to answer the question. The last question on parents' main occupation was, therefore, not included in the analysis of the data.

4.4.4 Interviews

The qualitative interviews were conducted with learners in April and May 2007 and the principals were all interviewed formally and informally several times during the research period (January to July 2007). From April to July 2007 the remainder of the interviews were conducted. These included interviews with the class teachers and the teachers responsible

---

[53] The paper form was used in all the schools for consistency.
[54] It was also used in 2008 in Iceland after the data collection in South Africa in 2007.

for computer use at each school as well as with the educational officers from the Western Cape Education Department responsible for the coordination of implementing ICT in the schools. Moreover, several scholars and specialists working within the field of ICT, language and/or policy were interviewed during this period. Altogether, 34 randomly selected learners were interviewed, 6 teachers, 3 principals and 10 education specialists. The interviews with principals and teachers lasted from 45 minutes to over two hours. Interviews with learners lasted from 20–40 minutes.

The qualitative interviews included some of the same questions as in the questionnaires, but the format was open ended and, therefore, allowed for different answers. Interview guides were used but the interviews were very much influenced by the respondents' interests and emphases. Due to the flexible nature of the qualitative design, the interview guides can be modified if necessary, to include issues that are frequently mentioned or to exclude issues which do not seem to be relevant (Lofland & Lofland, 1984). Some of the questions in the interview guide proved to be of less value or interest to the participants whereas others frequently called for reflection and follow-up questions. The interview guide was prepared so that the participants would receive the same basic questions. The interview guide was semi-structured, which gave the researcher more freedom to adapt, add, and cut questions according to individual responses. Four semi-structured interview guides were prepared for different groups of participants. One was intended for the learners, one for the teachers, one for the Khanya officials, and one for the principals and other specialists (see appendices 2-5). The semi-structured interview guides were categorized into themes and participants always got at least one question from each category. All the interviews were tape recorded after the participants acknowledged their acceptance of the use of a recorder. The interviews were recorded in order to capture the answers correctly and to allow the interviewer the ability to concentrate on the conversation as opposed to note taking. The learners were interviewed in pairs. It was of help to have an audio file to listen to in order to distinguish who had answered the questions. The longest interviews with the principals/teachers were nearly two hours in duration and the audio recordings were important in order to capture the extensive answers and explanations provided during the interviews.

Having experienced language difficulties, especially in Xolani, during the observation period, it was decided to interview two learners together, one pair at a time, with the possible benefit of having the learners feel less intimidated by the questions or the research situation. This proved to work well and this procedure was also used in interviews

with learners in Eaglewood and Freewill for coherence. In Xolani there was, additionally, an isiXhosa-speaking interpreter present during the interviews in order to solve language difficulties and to explain questions in the learners' home language when needed.

4.4.5 Other sources

Other sources of data included policy documents from the Department of Education, WCED and the Khanya initiative. In addition, samples of curriculum materials from literacy and numeracy classes focusing on the use of computers in the classroom were gathered. Two of the schools also had an ICT school policy, which became a part of the written documents gathered during the fieldwork.

4.5 Data analysis

After the fieldwork and during the analytical process and paper writing stage, the data gathered gained primary and secondary status (see Table 5). Primary status relates to core data, which had dominant status in the analysis whereas the secondary data provided supplementary status or confirmatory information in the analysis. The different kinds of data assumed different roles in the analytical process according to their primary or secondary status. Whereas the interviews as well as the questionnaires are the primary data, observations, documents, and audio files are of secondary importance.

An analytical process can be either deductive or inductive. Whereas an inductive analysis refers to using analytical categories or key terms to explain social phenomena gradually obtained from fieldwork and empirical data material, deductive analysis is linked to hypothesis testing. The data analysis in this study was a process that took place throughout the entire fieldwork period and evolved around the gathering of empirical data; thus, it was inductive, based on a theoretical foundation within critical theory. Research findings were linked to the underlying theory and associated with the specific domain of inquiry. The data analysis involved an integration of statistical analysis with thematic- or content-based analytical techniques for the qualitative data.

The approximately 34 hours of formal interviews were first transcribed. The transcribing process started during the fieldwork and all the interviews were transcribed word by word, which resulted in hundreds of pages of transcribed interviews. The interviews, which were conducted in English (at Acadia and Eaglewood), were transcribed word by word in English and according to the way the informants spoke (including

grammatical flaws). The interviews from Xolani were slightly more complicated to transcribe. They all started in English but became more and more dominated by the learners' home language, isiXhosa. These interviews were transcribed and translated by two different people - first by the interpreter herself and then by a professional translator. Some discrepancies were found between the two translations. These were verified by a third isiXhosa-speaking researcher but a few remaining and uncertain sections were not used in writing up the findings nor presented in the papers.

Table 5. *Overview of data types and status*.

Activities	Types of data	Status of data
2006: Pilot visit to two schools	Questionnaire N = 91	Primary
2007: Fieldwork in four schools	Questionnaire N = 290	Primary[55]
	Interviews with learners	Primary
	Interviews with teachers	Primary
	Interviews with principals	Primary
	Interviews with Khanya officials	Primary
	Interviews with other specialists	Primary
	Classroom observations – Field notes	Secondary
	Over 20 hours of audio recordings; random examples from classroom observations	Secondary
	Documentary analysis of policies, programme documents, school curriculum, schools' ICT policies	Secondary
2008: Field visit	Interviews with Khanya officials	Secondary
	Additional observations in Eaglewood	Secondary
2008–2010: Online correspondence	e-mail correspondence with teachers, principals, Khanya officials and educational specialists at UWC	Secondary

---

[55] In chapter 4.2 I explain that the mixed method design used is a QUAL-quan dominant-less dominant design and that the quantitative data is complimentary. Despite its complimentary role in the overall research process, the (quantitative) questionnaires together with the (qualitative) interview data are, however, the primary data when compared to other data sources.

When the interviews had been transcribed, they were imported into the NVivo software for further analysis. Additionally, informal interviews were also conducted in the schools. These were reported in the field notes, which were normally noted down after each day. Closely connected to the theoretical focus, a few key terms, identified from the pilot study, served as an analytical lens throughout the fieldwork. Moreover, the interviews were first categorized and coded according to key questions in the interview guide and the questionnaire (language issues, learners' use of ICT, background, teachers, out of school use and so on). The next step was to undertake a focused coding by subdividing the existing categories and identifying repeating themes across different interviews. The language category was, for example, subdivided into issues regarding code switching, policy, language choice, revitalisation of language, home language, language of instruction, language in the computer room, online/software language content and attitudes including pride, power and status of language. The observation data (field notes) also gave indications on possible themes or coding categories (for example, on language use in the computer room, learners' use of computers and teachers' ICT skills). All the data in a relevant coding category were identified and examined with constant comparison (Strauss & Corbin, 1990). The interviews (of learners, teachers and principals) were compared in order to identify patterns, linkages or discrepancies both within groups (i.e. among the learners or among the teachers) and between groups (learner, teacher and principals data combined).

The questionnaires were initially prepared as a web-based sheet, which could be converted directly into SPSS or Excel. Due to unforeseen technical difficulties, as has been mentioned before, this was impossible and the learners ended up filling in the questionnaire on paper. Each answer sheet was numbered and registered into an Excel sheet. Later on, the data were imported from Excel into SPSS in order to do statistical analysis. Descriptive statistics were generated and included frequencies and ratios as well as means and standard deviations. Additionally, Chi Square tests and ANOVA analyses comparing means were used in order to identify differences between groups (gender, school, home language, medium of instruction). For multiple comparisons, Games Howell and Scheffé Post Hoc tests were used (Field, 2009). Games Howell is a Post Hoc test that fits well when group sizes are unequal.[56] The Games Howell test can be liberal when group sizes are small; therefore, the Scheffé Post Hoc test was also conducted (Brace, Kemp, & Snelgar, 2006; Field, 2009).

---

[56] Learners in Eaglewood were much fewer than learners in the other schools.

4.6 Evaluating quality in a mixed method design

Lincoln and Guba (1985) identify validity criteria, which have been used within the quantitative research tradition and corresponding terms used within the qualitative research tradition (see Table 6).

Table 6. *Comparison of quality criteria for quantitative (conventional terms) versus qualitative (naturalistic terms) research* (Lincoln & Guba, 1985).

Conventional terms	Naturalistic terms
Internal validity	Credibility
External validity	Transferability
Reliability	Dependability
Objectivity	Conformability

Internal validity refers to whether the research is measuring what it claims to be measuring i.e. whether a relationship between the different variables exists and how accurate an account of "reality" is given. Credibility, however, refers to the richness of the collected data and can be enhanced through triangulation. Patton (1990) identifies different triangulation processes in order to verify qualitative data material: 1) methods' triangulation, 2) data triangulation, 3) multiple analyst[57] triangulations, and 4) theory/perspective triangulation. In the present study, the use of the mixed method design is in line with Patton's methods' triangulation.

External validity examines to what extent the findings can be generalised to another group of people, different places or different times, if the same methods are used. At the same time, it is problematic to include local context(s) in the analysis if the aim is to have high external validity. Transferability depends on similarities between contexts and whether the research can be repeated in another context or even in the same context in another time period (Lincoln & Guba, 1985). Qualitative findings put great weight on the "contextual uniqueness" of findings (Bryman, 2008, p. 378). In paper III, the issue of transferability is discussed, including how the findings can be connected to other areas in South Africa or other countries where multi-cultural and multi-lingual learners provide increasing challenges for teachers. Closely related to external validity is ecological validity. Ecological validity refers to what extent research results can be generalized from one research setting to another. It contains a view on how data are influenced by the real-life situations of

---

[57] Multiple analyst triangulations refer to more than one analyst (Patton, 1990).

participants and it is, therefore, important to give as many characteristics of the participants as possible in order to raise the ecological validity (Brock-Utne, 1996). This, on the other hand, can be problematic as it is at the expense of anonymity.

Reliability denotes whether repeated measurements result in similar findings. Dependability refers to an "auditing approach", which is based upon keeping records of different phases in the research process, including issues regarding field notes, interview transcripts and the steps of the analytic process, resulting in the writing up of the findings. Auditing includes a peer review where a colleague evaluates the process (Bryman, 2008). In doctoral work and in writing an article-based dissertation, much of the process and the analytical path is discussed within research groups and networks of colleagues, not to mention the feedback from the blind peer review of the papers.

To carry out totally objective and value-free social research is, however, not considered possible; moreover, a transformative approach argues against this notion. Within qualitative research, the concept of conformability applies to the researcher who has acted in good faith and has tried to prevent personal biases or theoretical partiality from influencing the research process unduly. In the context of this study, researcher reflexivity has been discussed, referring to possible personal biases and influences on the theoretical approach and methods chosen.

Hence I argue that the difference between the quantitative and the qualitative terms is not incompatible. Acknowledging the underlying framework of the transformative paradigm and critical theory, generalisation and transferability are not appropriate criteria for the research questions of the study. On the contrary, the intention is to give a unique account of the appearance of the digital divide in selected schools at a certain point in time. As stated previously, the mixed method design is a "dominant-less dominant" design, complementing qualities of qualitative and quantitative method, their weaknesses and strengths.

4.6.1 Ethical consideration

The research acquired permits from the WCED (see appendix 7) and from the Khanya initiative prior to the main data collection (see appendix 8). The researcher discussed an outline of a parental acceptance form with the principals in the schools (see appendix 9). The researcher also sent an introductory letter, together with a parental consent letter, in the appropriate language for the learners/parents in the three Khanya schools. The principals

added the school's letterhead to the form and signed it as an indication of approval and of the school's participation in the project. The principals had different views about the importance of the acceptance form being active or passive. In Acadia, parents received an active acceptance form, which meant that all the parents had to return the signed forms before their children could participate in the study. The principals in Xolani and Eaglewood did not consider it necessary to send out an active acceptance form and argued that the parents agreed with their children's participation as the school had already approved the participation in the study. The parents of children in Xolani and Eaglewood, therefore, received a passive acceptance form, meaning that, in the absence of a withdrawal from the study, parents accepted their children's participation. The principal in Freewill gave permission for gathering data from learners and the use of the learners' questionnaires in the school. All the learners could withdraw their participation if they so wished at any time. The research was also registered at the Norwegian Social Science Data Service (NSD).

When conducting fieldwork for six months and visiting the schools approximately once a week for 26 weeks, a personal relationship resulted with some of the key participants of the study. A central emphasis in the transformative paradigm and the standpoint of critical theories is that research leads to change, empowerment, or improvement for those involved. As of today, I still have contact with two of the four schools and the teachers and principals have received drafts to comment on and fully prepared papers, which are products of the study. The learners, however, have moved forward and finished their primary education. They have either started working or continued their education. Those less fortunate are unemployed and still struggling. I hope that the findings can contribute to a better understanding and a broader dialogue among policy actors and computer enthusiasts of the Khanya initiative on the different cultural aspects, such as language, that contribute to the digital divide in South African classrooms.

4.6.2 Methodological limitations

Issues connected to access to the field have been discussed in paper I, as well as in section 4.4.1. The openness and willingness to reflect and share thoughts with a foreign researcher is a challenge and this section discusses this challenge under the heading of methodological limitations. When conducting research in a foreign culture there are insider/outsider issues affecting the role of the researcher. Being an outsider can certainly have its challenges but, in order to minimize the possible effects, certain measures were taken.

a) Questions were piloted prior to the main study in order to better adapt methods to the local context.
b) The fieldwork duration was six months and started with an observation period so that learners and teachers got used to the researcher before the interview sessions started.
c) The learners were interviewed in pairs, one pair at a time, which was not as intimidating for the learners in what could have been a slightly overwhelming research setting.
d) The interviews were conducted in familiar surroundings (school library, the computer room, or the classroom).
e) The learners in Xolani had the opportunity to hear and respond to questions in isiXhosa, their home language.
f) The questionnaire was available in the three main languages of the region: Afrikaans, English and isiXhosa.

Despite the above-mentioned measures, there are still issues that may have affected the outcome of the study. At the first visit to both Xolani and Acadia, the researcher was introduced by the Khanya staff to the principal and grade seven teachers. During the first few weeks, the staff members mistook the researcher as a Khanya representative and were cautious in the informal conversations when talking about the implementation of computers in school. This, however, changed after a few weeks of fieldwork at the schools and the teachers spoke freely about their experiences with ICT use when they realised the independent researcher status, not linked to the Khanya initiative.

Teddlie and Tashakkori (2009) recommend a collaborative approach when interpreting the concurrent mixed method design. This is especially valuable when there is an inconsistency in answers between the different methods. Clear inconsistencies in answers did occur in the pilot phase and they were discussed with participants and colleagues. Due to these inconsistencies (see paper I), the design and type of questions were changed before the main data gathering took place.

Additionally it would have been an asset to develop the study design further, about the different learner groups and the interconnectedness of language, class, and ethnic group, and to consider how these factors are connected and influence social mobility. In the analysis, it was challenging to distinguish between background variables and to figure out to what extent these individually influenced the digital divide.

Adding a quasi-experimental component would have been interesting in order to compare learners' claimed skills with systematic observations on their use of certain computer programmes and online activities. Such an experimental component might have

revealed a greater discrepancy between what the participants said they could do versus what they could actually do in practise. In addition, greater attention to the use of computers outside of school might have revealed new issues regarding the interplay between school use and home (out of school) use. All the preceding issues indicate important directions for further research.

5.0 Summary of papers and discussion of findings

Reflections on the attached papers (I-IV), which make up Part II of this dissertation, appear in the first part. This last chapter gives attention to the individual papers, provides a brief summary of each paper, and discusses the main findings of the overall study.

5.1 Paper I – Importance of piloting

Paper I raised some methodological issues around piloting and access to a research site with particular focus on qualitative research. Piloting has not been emphasised greatly within this research approach. The authors' pilot studies in South Africa and in Norway form the basis of the paper and illustrate how the piloting process influenced two widely different studies. The studies use different designs, but have a common denominator in that they used pilot approaches in their preparatory processes. They are also similar in the intention of conducting research with a critical edge.

The first case study involved schools in South Africa in order to obtain access to the field and gain insight into ICT use in two schools. The second case study involved a group of teachers and their action research project, which questioned a school policy they did not feel benefitted schoolchildren in Norway. The two cases, presented separately, explore the change in conceptual and methodological emphasis in the research procedure. Emphasis is on showing how important the piloting and access processes are.

The authors argue that both piloting and gaining access can be forms of action research, in that the intention is to learn and to change future action; in other words, the purpose is to find out how to conduct a project more effectively in order to change or increase the validity of the whole research process. Through the piloting phase, learning that may prove invaluable for the later research process is likely to take place and piloting can contribute to better quality research results. While the best-case scenarios are overrepresented in the research literature, piloting and the following implications may be given much greater attention in the research literature, in general. The authors of this research paper argue that the learning from flaws and imperfections, discovered in the piloting phase of research, is equally important to the research community and to the actual participants in the research process. Yet these are under-utilized and often left under or unreported.

5.2 Paper II – Challenges and opportunities

The second paper is a book chapter comparing the digital divide in two different countries, South Africa and Iceland. There are huge differences in ICT use and skills between and within continents and countries, and between different societal groups characterized by the term digital divide. The discourse around the digital divide, with its associated metaphor of attempting to bridge it, has garnered criticism for being predominantly Western based; emphasis should rather be on converting a digital divide into a "digital dividend" by looking at successes and failures on both sides. With that vision in mind, there is a focus on re-conceptualizing the digital divide when viewing computer and Internet use, 'north' and 'south' of the divide.

Part of the findings are from this author's study on computer use among 290 seventh graders in four South African schools (data from 2007) and a comparison is made with a similar ongoing series of cross sectional studies conducted by Dr. Solveig Jakobsdottir in Icelandic schools among learners of similar age (data from 1998, 2002, 2004 and 2008).

The data were gathered through questionnaires in both countries. The data analysis revealed that in order to obtain large-scale benefits, large investments are needed: time, planning and coordinated efforts. Such efforts differ according to the particular circumstances in each of the countries. There is a much greater range in ICT skills between the learners in South Africa than between the learners in Iceland, which signals a special challenge for South African educators and policy makers. This can partly be explained by varied out-of-school access. Some challenging questions are raised around some negative consequences of the widespread teenage usage of ICT outside schools in Iceland and how and if that information can benefit learners in South Africa. Similarly, the challenges of multi-ethnic and multi-lingual classrooms in South Africa are put into perspective and the comparison discusses how that information can benefit Icelandic learners. The paper discusses common challenges and educational opportunities both countries face such as the costs of maintenance, updating hardware and renewing software licenses. Connected to high costs is also the challenge to provide software and digital learning resources in the home language of the learners. Finally, the time available for learners to use computers is a challenge in both countries, and so far, computers are more likely to support the curriculum rather than to extend or transform teaching and learning practises.

5.3 Paper III – Teachers and the language issue

The aim of this paper is to highlight some of the challenges of ICT integration in a South African classroom setting. The focus is on the concept of a digital divide, and how cultural complexity, with special emphasis on language, may widen the divide in schools that already have material access to ICT. Fieldwork in seventh-grade classes in four primary schools in Cape Town, South Africa provides the basis for the study. The paper reports results from a questionnaire answered by learners regarding ICT use and skills and discusses interviews conducted with learners, teachers, and principals. Moreover, the paper argues that the challenges of language in South African schools can exacerbate or maintain the digital divide among learners who are already disadvantaged due to a range of social inequalities. The findings indicate that for learners to master the use of ICT fully in today's knowledge society, ICT integration needs to take into account the local context, which also includes the use of ICT in a familiar language. Research on ICT, therefore, requires a perspective of understanding emerging technology not simply as a technology or a tool, but as an integral aspect of the socio-cultural surroundings within the community, including that of language and policy initiatives. Moreover, policymakers do not sufficiently highlight the language issue when focusing primarily on material access to ICT. Learners and their teachers experience clear challenges in the classroom, but to fight the existing divides proactively, they need to have the freedom to choose and the capability to use ICT in their own language.

Moreover, the paper suggests that greater opportunities for teacher training are needed in order to enhance culturally sensitive and appropriate ICT integration based on local needs and capacity. The teachers, just like the learners, are not using the technology to a great extent outside of school; they need the chance to raise their competence so that using ICT becomes a feasible addition to their teaching practise.

5.4 Paper IV – Learners competence in and out of school

This paper explores factors that influence the digital divide in four schools in Cape Town, South Africa. All the schools use ICT in their curriculum delivery, and thereby, support the emphasis of the provincial educational authorities on ICT access for all. The study explores factors inside and outside of school, which affect learners' ICT competence, and hence, the digital divide. The paper reports on results from interviews, observations, and

questionnaires and compares learners' ICT competence between and across schools in relation to gender, home access, and home language.

Various factors within and outside of school influence learners' ICT competence, and thereby, affect the digital divide. When the data were examined, the study reported wide differences between the schools in the range of ICT self-reported skills. Gender differences were not reported and that can possibly be explained by the equalising effect of learners' school use.

The main findings indicate that, despite substantial efforts by educational authorities to increase equality in ICT access by integrating ICT in all public schools, issues of equity are neglected. In order to increase digital equity and decrease the digital divide, a renewed policy focus is necessary to place greater emphasis on addressing the severe inequalities of the learners within and outside their school environments, taking their home situations into consideration to a greater extent.

5.5 Reviewing the research questions

The empirical data resulting from the mixed method of data gathering and analysis points at several issues that constitute the main findings of the study. The main objective was to explore how the digital divide manifests' itself in South African classrooms. Focusing on this objective, several research questions guided the study.

The focus in paper I is on the methodological aspects of the study. Emphasis is on the importance of doing thorough groundwork by using piloting methods and approaches in order to adapt or change these so that they best fit research aims and increase the quality of research results. The aim of paper I was to increase awareness of the importance of pilot studies for validity issues and gaining access. Furthermore, the intention was to contribute to greater understanding of dimensions affecting the digital divide in two widely different classrooms.

The first research question addresses the comparative aspect of this study and it is answered in paper II. *How do Icelandic and South African learners evaluate their computer skills and what are their attitudes in relation to computer use?*

The learners reported on their computer skills by answering a questionnaire. There was a great variety in the answers but those answers identified both the local digital divide in South Africa as well as the global digital divide between Icelandic and South African learners. Furthermore, the South African learners reported a greater span in their ICT skills,

which points towards greater social disparities in the society. However, the South African learners showed greater enthusiasm and motivation towards ICT use than the Icelandic learners did, possibly due to the novelty effect of ICT in South Africa.

The second research question is *what are the ICT related challenges and opportunities learners and the educational sector face in the different cultural contexts of Iceland and South Africa?* Paper II thoroughly discusses numerous challenges and opportunities related to the SCCF including both micro and macro dimensions. These relate to time, physical and social problems, attitudes and motivation of the learners, finance, out of school access, digital resources, open access, and localization. Moreover, some of the challenges and opportunities of the South African learners are also discussed in papers I, III and IV.

The third research question is *what is exacerbating or maintaining the digital divide in schools that already have material access to computers?* Paper III focuses on answering this question by pointing to the lack of support for teachers and the need for greater teacher training in the use of ICT. This relates to the argument that the teachers have a key role in implementation and use of ICT in the classroom (see section 1.4). Paper III additionally points to the language issue in South Africa and the discrepancy between home language and LoLT and the ways this influences learners' capabilities to obtain optimal learning. The fourth research question is, consequently *how do linguistic aspects influence the digital divide in the South African classroom?* The language issue in South African classrooms does affect the use of ICT. Learners with English as their home language are at an advantage since content on the Internet, the computer platform and the LoLT in schools is mostly in English. The strong status of English is maintained through LoLT and ICT integration whereas little or no attention is given to the home language of the learners (in the case of this study especially the isiXhosa learners). This fourth research question is primarily answered in paper III.

Paper IV answers the remaining research questions. First, *which factors inside and outside of school significantly affect the digital divide?* And second, *how do these factors affect the ICT skill level of learners and their capabilities?* In paper IV, the focus is on home access of the different learner groups and the digital divide is connected to learners' skills and ICT competence at school. The school environment is significant for learners' ICT competence. The author argues, however, that despite digital equality in the sense that learners have obtained increased material access to ICT, digital equity based on ethical judgement in the sense of fairness has not yet been obtained. For that, a renewed policy

focus is necessary to address the severe inequalities of the learners within their school environment as well as outside of school. Moreover, learners with limited access outside of school may need alternative ways of using ICT within school in order to raise their ICT competence.

5.6 Discussion of findings and contribution of the study

Von Glaserfeld (1991) claims that knowledge should be functional and evaluated by its capacity to accomplish something. Moreover, one of the common denominators of comparative educational research is the "fundamental belief that education can be improved and can serve to bring about change for the better" (Arnove, Altbach, & Kelly, 1992, p. 1). With this in mind, this section discusses the main findings across the papers.

A unique dimension in comparative studies is the comparing of similarities and differences in different cases. This study has compared methods of piloting and access in Norway and South Africa (paper I) and ICT use and skills in Iceland and South Africa (paper II). Moreover, learners and their ICT competence and access in four schools in South Africa have been compared (papers III and IV). All the papers share critical perspectives on the implementation of computers in education and the concept of digital divide, which is discussed as a manifestation of power and inequality. In addition to answering the research questions, the necessity to re-conceptualize the digital divide has been emphasised by adding greater weight on the contextual background of participants and addressing the relevance divide (see *Figure 4*); the author argues that re-conceptualizing the term digital divide and viewing it from different levels contributes to a comprehensive understanding of its complexity. The dissertation provides findings on the different levels of the concept digital divide and investigates how they influence disadvantaged learners and their teachers, in general, and more specifically, their use of ICT in the classroom. It provides an analysis that goes beyond statistical ways of measuring the digital divide, such as counting the number of computers, measuring bandwidth, and technological infrastructure.

The analyses in papers I – IV recognize different challenges in terms of greater ICT competence and transformative ICT use in the classroom. In all the papers policy implementation is identified as important to provide disadvantaged learners and teachers new opportunities that lead to real change. Furthermore, many of the learners and teachers have limited opportunities to use ICT, which suggests that they are not "digital natives" (Bennett, Maton, & Kervin, 2008). The findings in the study point to the lack of time,

opportunities to use ICT in and out of school, training and support, relevant content and access to technological assistance as dimensions influencing the digital divide. Moreover, learners' linguistic background and status influence their ICT access and competence, which indicates a link between the digital divide and the greater social divides.

The first paper has a somewhat different content than the other three papers as it focuses on methodological challenges and argues for a change in research practises. Due to its significance for the research process, it has been included as one of the papers in Part II. The pilot study revealed severe language difficulties within the township school and showed how research is essentially influenced by the context in which the participants are situated. Furthermore, the gap between users and non-users of ICT was evident and linked to existing social divides. Both the piloting process and gaining access to a field site form part of the action research process, in that the intention is to learn and to change future action in a study that follows. By reflecting on the piloting process and its results, the authors argue that piloting is underutilized, but important, as it is an on-going process with a strong improvement or change capacity. This author, therefore, argues that the importance of piloting and gaining access to the research site can be considered as one of the significant findings of the study.

Related to the challenges of contextual factors, the study revealed certain societal and policy challenges. ICT policy documents in South Africa (see discussion in paper II and III) do, to a limited degree, take into consideration the differences in learners' home (out of school) situations. This study revealed the importance of out of school factors on the ICT competence of learners (paper IV) as the learners who had access and used ICT outside of school indicated they had greater ICT competence than those with limited home access. Collins and Halverson claim that:

> [T]here are deep incompatibilities between technology and schooling. Thus, it is no surprise that technology's main impact on learning is occurring outside of school. In consequence, we believe that policy leaders must rethink education both inside and outside of the school context. (Collins & Halverson, 2009, p. xiv)

Thus, due to the remaining social disparities in South Africa, there is not only a difference in ICT use and access within school, but also outside of school. The study reveals that introducing ICT at school in order to reduce the digital divide needs to include more than only providing computers to the learners and teachers. One of the arguments of the study is

the need for increased access and support for those learners who do not have access at all outside of school. Such learners need better opportunities within the education system if the goal is to equalize access and diminish the digital divide.

In a globalized world, there is a growing trend to find global solutions to global problems. The digital divide is one such global problem, however, the study indicates that this view has partly ignored the local context and cultural relevance of learners and teachers in the implementation and use of ICT within the educational sector (paper II). This necessitates the need for greater consideration of cultural diversity of learners and teachers, including language issues and availability of learning materials and localised content. Learners who do not have English as a home language face a double literacy trap, meeting a different language from their own at school and through materials and software connected to the use of ICT at school. The learners who do not have English as their home language are more likely to be placed on the less fortunate side of the digital divide, as they experience a language barrier when accessing online material and educational software. Certainly, this is a part of a much more extensive debate on the medium of instruction and to what extent children in Africa should learn in a foreign language instead of their home language (see papers I – IV).[58]

Moving the focus to the teachers, their role is especially important in the integration of ICT in the classroom and their training opportunities and provided support are central. Increased access to computers is one thing, but being able to make pedagogical use of computers in a classroom setting is another (see paper III). These issues were also revealed in the different South African schools and in Iceland (see paper II). Moreover, the teachers were concerned with their time and workload. Teacher training opportunities and access to support were slim, which can explain insecurity in the use of ICT with their learners. At the same time, the differences between schools' computer room time availability to every learner was evident. Group (class) sizes and accessibility of computers point out some of the difference between learners ICT competence and the digital divide across the four schools. Consequently, it is argued that in order to achieve large-scale benefits from ICT use in education, significant investments are needed, keeping in mind the instrumental, intrinsic and the positional value of education (see section 3.4).

---

[58] Indeed, it is important for learners to have a good command of a foreign language such as English, for example, but it is equally important that they learn English as a foreign language from specialist foreign language teacher rather than learning English through the language of instruction in all subjects taught by teachers and subject specialists of other curriculum subjects.

Finally, when it comes to re-conceptualizing the term digital divide, the study points towards the different levels of the divide from basic needs and material divide to opportunity, skills, and relevance divide (see *Figure 4*). These different aspects are connected to both macro and micro levels; that is, to factors within school as well as to societal or policy levels, which influence the educational system. The study has revealed that the digital divide within South African classrooms is not only about securing material access to computers and providing the necessary technological infrastructure. Instead, it is about the structural inequalities within the society, mirrored within the school system, and the ways in which disadvantaged teachers and learners use ICT without adequate support and relevant content.

5.7 Conclusion - Increasing digital opportunities – enhancing change

The title of the study *From digital divide to digital opportunities?* embraces a question on how the uneven access and diffusion of ICT can be addressed in order to trigger increased opportunities for those involved. The study has looked at how the so-called digital divide appears in selected classrooms in the context of a developing country.

The implementation of ICT in education has been viewed with optimism and hope in the Western Cape and teachers and learners see it as a way to generate change, in the sense that it increases opportunities to participate in the knowledge society by furthering their education and easing the transition from school to the world of work. As Assar, Amrani and Watson (2010) argue, many teachers in developing countries are, however, using ICT on a limited scale in their classrooms. They are merely using ICT to access information rather than using it as a part of a transformative pedagogy, which will further empower learners. Part of the explanation is certainly that the majority of the teachers have not received the training they need or the support required in order to use ICT to transform or change existing talk and chalk practises. Transformative pedagogy includes "previously excluded perspectives and experiences of groups that historically have had marginalized participation in educational settings" (Nagda, Gurin, & Lopez, 2003, p. 167). Within the classroom setting, transformative teaching practices engage learners as critical and active participants who, in turn, find alternative ways for empowerment and changing subordinated realities (Nagda et al., 2003). For greater emphasis around change in practise, a policy emphasis on access for all learners and teachers is required followed by realistic plans for implementation and support of innovative teaching practises.

The research process and findings of this study have, to a great extent, been discussed in dialogue with local actors, teachers and specialists, but there is always a risk of speaking for others rather than in dialogue with others (Alcoff, 1991). The findings from the pilot study were discussed and the emphasis was changed after consulting with colleagues at the UWC. While collecting data, two of the principals and two of the teachers became key informants and conversation partners; thus, this researcher could seek their advice on different issues concerning the research process, as well as on the South African society in general and how it possibly affected the research. Findings presented in papers II, III, and IV were also discussed with these key informants and other local specialists in the field, both from the Khanya initiative and from the UWC.

In summary, a study such as this one in a society like South Africa necessarily results in challenging inequalities and factors in society that limit learners' opportunities. In order to generate change, there is a need for greater understanding from policy makers on the importance of

- *Local involvement* (teachers and learners in and out of school, involving the parental community, involving the local community)
- *Local sustainability* (infrastructure, resources, financial means, support and leadership)
- *Local language and content* (more availability of software and local and meaningful content)

These elements play a part in providing real access and real opportunities for those who are disadvantaged, minimizing the divide apparent in the schools. The research perspectives, both the theoretical and methodological ones, thus propose a local perspective based on the South African frame of reference.

Finally, it is worth pointing out possible future research areas where this research fell short.[59] One of the areas that formed a part of the data material, but has not been discussed in papers I-IV, was the opportunities connected to mobile learning, especially through the use of mobile phones. Mobile learning or M-learning refers to many other handheld devices, but in the context of disadvantaged learners in a developing country, where access to mobile phones is generally greater than access to computers, internet connections or landline connections, this has become an interesting research area, opening up new opportunities.

---

[59] See also section 4.6.2.

For future research, this study calls attention to the importance of bringing in the issue of equity or social justice which includes an element of change and empowerment of the disadvantaged. Selwyn and Facer (2010, p. 11) talk about the importance of "[e]nabling all individuals to make informed and empowered choices about the uses of ICTs whilst ensuring these individuals have ready access to the resources required to enable them to act on these choices". The *digital opportunities* have, without a doubt, increased for the learners involved in this study, but in order to move a step further to greater equity and empowerment of the disadvantaged, there needs to be political and societal will for change. There is, however, often a disjuncture between what a policy wants and how it works in practice (Hunt, 2007). Mapi (2010), moreover, argues that: "the government seems to be dragging its feet. Many in government present themselves as transformers but, when it comes to implementation, there is suddenly nobody willing to talk and take any initiative". Therefore, a proactive policy is required which not only describes the need for equal rights, but is also pursued by implementing reforms that serve those who are disadvantaged. Moreover, adequate support for teachers who are supposed to integrate technology in their classroom practises is needed. Further research on the digital opportunities is important. Bringing focus to the different aspects of the digital divide and how development can be secured if emphasis on local expertise, local knowledge and local content is accentuated. Hopefully, this study can make a substantial contribution to promote research within this area of ICT4E and provide policy makers and educational officials with results to aid them in adapting their strategic plans for ICT in education, increasing digital opportunities for all learners in South Africa.

REFERENCES

Abdi, A. (2001). Integrated education and black development in post-apartheid South Africa: critical analysis. *Compare, 31*(2), 229-244.

Agarwal, R., Animesh, A., & Prasad, K. (2009). Social interactions and the "digital divide": Explaining variations in internet use. [Article]. *Information Systems Research, 20*(2), 277-294.

Alampay, E. (2006). Beyond access to ICTs: Measuring capabilities in the information society. *International Journal of Education and Development using ICT, 2*(3), 4-23.

Alcoff, L. (1991). The problem of speaking for others. *Cultural Critique*(20), 5-32.

Alexander, N. (1989). *Language policy and national unity in South Africa/Azania*. Cape Town: Buchu Books.

Alexander, N. (2000). English unassailable but unattainable: The dilemma of language policy in South African education. *PRAESA Occasional Papers No.3*. Cape Town: PRAESA.

Alvesson, M., & Sköldberg, K. (2000). *Reflexive methodology: New vistas for qualitative research*. London: Sage.

Alvesson, M., & Sköldberg, K. (2008). *Tolkning och reflektion: Vetenskapsfilosofi och kvalitativ metod* (2 ed.). Lund: Studentlitteratur.

Anderson, N., Courtney, L., Timms, C., & Buschkens, J. (Eds.). (2009). *Equity and information communication technology (ICT) in education*. New York: Peter Lang.

Arnove, R. F. (2003). Reframing comparative education:The dialectic of the global and the local. In R. F. Arnove & C. A. Torres (Eds.), *Comparative edcuation. The dialectic of the global and the local* (pp. 1-23). Lanham: Rowman & Littlefield Publishers.

Arnove, R. F., Altbach, P. G., & Kelly, G. P. (1992). Introduction. In R. F. Arnove, P. G. Altbach & G. P. Kelly (Eds.), *Emergent issues in education* (pp. 1-12). New York: State University of New York.

Arthur, J. (2001). Perspectives on educational language policy and its implementation in African classroom: a comparative study of Botswana and Tanzania. *Compare, 31*(3), 347-362.

Askonas, P., & Stewart, A. (2000). *Social inclusion: possibilities and tensions*. Basingstoke: Palgrave.

Assar, S., Amrani, R. E., & Watson, R. T. (2010). ICT and education: A critical role in human and social development. *Information Technology for Development, 16*(3), 151-158.

Banerjee, S., Kang, H., Bagchi-Sen, S., & Rao, H. R. (2005). Gender divide in the use of the internet applications. *International Journal of E-Business Research, 1*(2), 24-39.

Beinart, W. (2001). *Twentieth-century South Africa*. Oxford: Oxford University Press.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775-786.

Bergman, M. M. (2008). The straw men of the qualitative-quantitative divide and their influence on mixed methods research. In M. M. Bergman (Ed.), *Advances in mixed methods research* (pp. 11-21). Thousand Oaks: Sage.

Blaine, S. (2010, June 15). Poor basics blamed for school dropout rate. *Business Day*. Retrieved from http://allafrica.com/stories/201006150017.html

Bonk, C. J. (2009). *The world is open: How web technology is revolutionizing education*. San Francisco: Jossey-Bass.

Botha, R. J. (2002). *The introduction of a system of OBE in South Africa: Transforming and empowering a marginalized and disenfranchised society*. Paper presented at the Comparative and International Education Society (CIES), Orlando, USA.

Brace, N., Kemp, R., & Snelgar, R. (2006). *SPSS for psychologists. A guide to data analysis using SPSS for Windows*. Basingstoke: Palgrave Macmillan.

Bray, M., & Murray, T. R. (1995). Levels of comparison in educational studies: Different insights from different literatures and the value of multilevel analyses. *Harvard Educational Review, 65*(3), 472-491.

Breidlid, A. (2002). Schooling, tradition and modernity in South Africa. *UWC Papers in Education, 2*, 37-50.

Breidlid, A. (2004). Sustainable development, indigenous knowledge systems and education in South Africa. *Journal of Teacher Education and Training, 4*, 3-19.

Bridges.org. (2005, December 26, 2005). Real access - real impact criteria. Retrieved June 7, 2010, from http://www.bridges.org/Real_Access

Britz, J. J. (2004). To know or not to know: A moral reflection on information poverty. *Journal of Information Science, 30*(3), 192-204.

Brock-Utne, B. (1996). Reliability and validity in qualitative research within education in Africa. *International Review of Education, 42*(6), 605-621.

Brock-Utne, B. (2000). *Whose Education for All? The recolonization of the African mind*. London: Taylor & Francis.

Brock-Utne, B., Desai, Z., & Qorro, M. (Eds.). (2003). *Language of instruction in Tanzania and South Africa (LOITASA)*. Dar-es-Salaam: E & D Limited.

Brock-Utne, B., Desai, Z., & Qorro, M. (Eds.). (2004). *Researching the language of instruction in Tanzania and South Africa (LOITASA)*. Cape Town: African Minds.

Brock-Utne, B., Desai, Z., & Qorro, M. (Eds.). (2006). *Focus on fresh data on the language of instruction debate in Tanzania and South Africa*. Cape Town, South Africa: African Minds.

Brock-Utne, B., & Holmarsdottir, H. (2003). Language policies and practises - some preliminary results from a research project in Tanzania and South Africa. In B. Brock-Utne, Z. Desai & M. Quorro (Eds.), *Language of instruction in Tanzania and South Africa (LOITASA)* (pp. 80-101). Dar es Salaam: E & D Limited.

Brock-Utne, B., & Hopson, R. (Eds.). (2005). *Languages of instruction for African emancipation: Focus on postcolonial contexts and considerations*. Dar es Salaam, Tanzania and Cape Town, South Africa: Mkuki na Nyota and The Centre for Advanced Studies of African Society.

Brock-Utne, B., & Lwaitama, A. (2010). African philosophy – a Tanzanian perspective. In Z. Desai, M. Qorro & B. Brock-Utne (Eds.), *Educational challenges in multilingual societies: LOITASA Phase Two Research*. Cape Town: African Minds.

Brown, C., & Czerniewicz, L. (2010). Debunking the 'digital native': beyond digital apartheid, towards digital democracy. *Journal of Computer Assisted Learning, 26*(5), 357-369.

Brown, W., & Brown, I. (2008). Next generation ICT policy in South Africa: Towards a human development-based ICT policy. In C. Avgerou, M. L. Smith & P. van den Besselaar (Eds.), *Social dimensions of information and communication technology policy* (Vol. 282, pp. 109-123). Boston: Springer.

Bryman, A. (2006). Integrating quantitative and qualitative research: how is it done? *Qualitative Research, 6*(1), 97-113.

Bryman, A. (2008). *Social research methods* (3 ed.). Oxford: Oxford University Press.

Buckingham, D. (2006). Defining digital literacy. What do young people need to know about digital media? *Digital Kompetanse, 4*(1), 263-276.

Burger, D. (Ed.). (2005). *South Africa yearbook 2005/2006*. Pretoria: GCIS.

Buszard-Welcher, L. (2001). Can the web help save my language? In L. Hinton & K. Hale (Eds.), *The green book of language revitalization in practice*. San Diego, CA: Academic Press.

Calderaro, A. (2010). The digital divide, framing and mapping the phenomenon. In E. Ferro, Y. K. Dwivedi, J. R. Gil-Garcia & M. D. Williams (Eds.), *Overcoming digital divides. Constructing an equitable and competitive information society* (Vol. I, pp. 21-39). Hershey: Information science reference.

Carr, W., & Kemmis, S. (1986). *Becoming critical: Education, knowledge, and action research*. London: Falmer Press.

Carter, D. (2007). Turning the digital divide into a digital, dividend: Some experiences from Manchester, UK. In T. McMaster, D. Wastell, E. Fermeley & J. I. DeGross (Eds.), *Organizational dynamics of technology-based innovation: Diversifying the research agenda* (Vol. 235, pp. 19-29). Laxenburg: IFIP-International Federation Information Processing.

Castells, M. (2000). *The information age. Economy, society and culture* (Vol. 1). Oxford: Blackwell Publishers.

Castells, M. (2003). *The internet galaxy. Reflections on the internet, business, and society*. Oxford: Oxford University Press.

Chambers, R. (1997). *Whose reality counts? Putting the first last*. London: Intermediate Technology Publications.

Chen, W., & Wellman, B. (2004). The global digital divide - Within and between countries. *IT & Society, 1*(7), 39-45.

Chigona, A., Chigona, W., Kayongo, P., & Kausa, M. (2010). An empirical survey on domestication of ICT in schools in disadvantaged communities in South Africa. *International Journal of Education and Development using ICT, 6*(2), online.

Clark, N. L., & Worger, W. H. (2004). *South Africa. The rise and fall of apartheid*. Harlow: Pearson Education Limited.

Cohen, L., Morrison, K., & Manion, L. (2007). *Research methods in education*. London: Routledge.

Collins, A., & Halverson, R. (2009). *Rethinking education in the age of technology. The digital revolution and schooling in America*. New York: Teachers College Press.

Compaine, B. M. (2001). *The digital divide: Facing a crisis or creating a myth?* Cambridge, MA: The MIT Press.

Computers4kids. (2011). About computers 4 kids. Retrieved April 10, 2011, from http://www.computers4kids.co.za/about.php

Cotten, S. R., & Jelenewicz, S. M. (2006). A disappearing digital divide among college students? Peeling away the layers of the digital divide. *Social Science Computer Review, 24*(4), 497-506.

Creswell, J. W. (2009). *Research design: qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, California: Sage Publications.

Creswell, J. W., & Plano Clark, V. L. (2008). *The mixed methods reader*. Thousand Oaks, California: Sage.

Cross, M., Mungadi, R., & Rouhani, S. (2002). From policy to practice: Curriculum reform in South African education. *Comparative Education, 38*(2), 171-187.

Crossley, M., & Watson, K. (2003). *Comparative and international research in education: globalisation, context and difference*. London: Routledge.

Crouch. (1996). Public education equity and efficiency in South Africa: Lessons for other countries. *Economics of Education Review, 15*(2), 125-137.

Crystal, D. (2001). *Language and the internet*. Cambridge: Cambridge University Press.

Czerniewicz, L. (2004). Cape of Storms or Cape of Good Hope? Educational technology in a changing environment *British Journal of Educational Technology, 35*(2), 145-158.

Czerniewicz, L., & Brown, C. (2005). The uses of information and communication (ICT) in teaching and learning in South African higher education practices in the Western Cape. *Perspectives in Education, 23*(4), 1-18.

Davies, C. A. (2008). *Reflexive ethnography: a guide to researching selves and others*. London: Routledge.

de Sardan, J.-P. O. (2005). *Anthropology and development: Understanding contemporary social change*. London: Zed Books.

Deacon, R., Osman, R., & Buchler, M. (2010). Scholarship in teacher education in South Africa, 1995-2006. [Article]. *Perspectives in Education, 28*(3), 1-12.

Deegan, H. (2001). *The politics of the new South Africa: Apartheid and after*. London: Longman.

Denzin, N. K., & Lincoln, Y. S. (2005). Introduction. The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), (pp. 1-32). Thousand Oaks: Sage.

Denzin, N. K., Lincoln, Y. S., & Smith, L. T. (Eds.). (2008). *Handbook of critical and indigenous methodologies*. Thousand Oaks: Sage.

Department of Communications. (2010). Strategic plan 2010-2013. Making South Africa a global leader in the development and use of ICTs for socio-economic development. Retrieved December 10, 2010, from http://www.info.gov.za/view/DownloadFileAction?id=144185

Department of Education. (2000). *Education for all: The South African assessment report*. Pretoria: Department of Education.

Department of Education. (2003). *Learning and teaching through information and communication technologies (ICT)*. Retrieved from http://wced.wcape.gov.za/circulars/minutes05/lg.html#www.info.gov.za/gazette/whitepaper/2004/26734.pdf*e_inf_top.html#edits3_05.html.

Department of Education. (2004a). Draft white paper on e-education. Transforming learning and teaching through information and communication technologies (ICTs). Retrieved January 10, 2008, from http://wced.wcape.gov.za/circulars/minutes05/lg.html#www.info.gov.za/gazette/whitepaper/2004/26734.pdf*e_inf_top.html#edits3_05.html

Department of Education. (2004b). White paper on e-education. Transforming learning and teaching through information and communication technologies (ICTs). Retrieved October 10, 2008, from http://www.capegateway.gov.za/eng/publications/white_papers/2004/93586

Desai, Z. (1995). The evolution of a post-apartheid language policy in South Africa: an on-going site of struggle. *The European Journal of Intercultural Studies, 5*(3), 18-26.

Desai, Z. (1999). Enabling Policies, Disabling Practises. *Per Linguam. A Journal of Language Learning, 45*(1), 42-53.

Desai, Z. (2001). Multilingualism in South Africa with particular reference to the role of African languages. *International Review of Education, 47*(3), 323-339.

Desai, Z. (2003). A case for mother tongue education? In B. Brock-Utne, Z. Desai & M. Quorro (Eds.), *Language of instruction in Tanzania and South Africa (LOITASA)* (pp. 45-68). Dar-es-Salaam, Tanzania: E & D.

Education Labour Relations Council. (2005). Study of demand and supply of educators in South African public schools. *Media briefs*. Retrieved from http://www.hsrc.ac.za/Media_Release-235.phtml

Escobar, A. (1991). Anthropology and the development encounter: The making and marketing of development anthropology. *American Ethnologist, 18*(4), 658-682.

Etzo, S., & Collender, G. (2010). The mobile phone 'revolution' in Africa: Rhetoric or reality? *African Affairs, 109*(437), 659-668.

European Union. (2006). Recommendation of the European parliament and of the council of 18 December 2006 on key competences for lifelong learning. *Official Journal of the European Union* Retrieved December 30, 2008, from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:EN:PDF

Ewing, J. (2007). Upwardly mobile in Africa. *Bloomsberg Businessweek*. Retrieved from http://www.businessweek.com/magazine/content/07_39/b4051054.htm

Fantognan, X. (2005). *A note on African languages on the worldwide web*. Montreal: UNESCO.

Fataar, A. (1998). Access to schooling in a post-apartheid South Africa. Linking concepts to context in education after apartheid. In Kallaway, Kruss, Fataar & Donn (Eds.). Rondebosch: UCT Press.

Field, A. (2009). *Discovering statistics using SPSS*. Thousand Oaks, California: Sage.

Fiske, E. B., & Ladd, H. F. (2004a). Balancing public and private resources for basic education: School fees in post-apartheid South Africa. In L. Chisholm (Ed.), *Changing class. Education and social change in post-apartheid South Africa* (pp. 57-88). Cape Town: HSRC.

Fiske, E. B., & Ladd, H. F. (2004b). *Elusive equity. Education reform in post-apartheid South Africa*. Washington D.C.: Brookings Institution Press.

Foucault, M. (1972). *The archaeology of knowledge and the discourse on language*. New York: Pantheon Books.

Foucault, M., & Gordon, C. (1980). *Power/knowledge: Selected interviews and other writings 1972-1977*. Brighton: Harvester Press.

Frank, A. G. (1996). The underdevelopment of development. In S. Chew & R. Denemark (Eds.), *The underdevelopment of development* (pp. 17-55). London: Sage.

Freire, P. (1998). *Pedagogy of freedom: ethics, democracy, and civic courage*. Lanham, Md.: Rowman & Littlefield.

Funredes, D. P. (2005). Measuring linguistic diversity on the internet. Retrieved January 15, 2006, from http://portal.unesco.org/ci/en/ev.php-URL_ID=20804&URL_DO=DO_TOPIC&URL_SECTION=201.html

Geertz, C. (1977). *The interpretation of cultures*. New York: Basic Books.

GESCI. (2010). ICT4E in the knowledge society. Retrieved June 8, 2010, from http://www.gesci.org/ict4e-in-the-knowledge-society.html

Gilmore, D., & Soudien, C. (2010). Learning and equitable access in the Western Cape, South Africa. *Comparative Education, 45*(2), 281-295.

Goldfinch, S., Gauld, R., & Herbison, P. (2009). The participation divide? Political participation, trust in government, and e-government in Australia and New Zealand. *Australian Journal of Public Administration, 68*(3), 333-350.

Govender, D. W., & Maharaj, M. (2007, June 25-27). *Challenges with respect to the e-readiness of secondary school teachers in KwaZulu-Natal, South Africa.* Paper presented at the 12th Annual Conference on Innovation & Technology in Computer Science Education - Inclusive Education in Computer Science, Dundee, Scotland.

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research 3rd edition* (pp. 191-215). Thousand Oaks: Sage.

Gudmundsdottir, G. B. (2010a). From digital divide to digital equity: Learners' ICT competence in four primary schools in Cape Town, South Africa. *International Journal of Education and Development Using Information and Communication Technology, 6*(2). Retrieved from http://ijedict.dec.uwi.edu/include/getdoc.php?id=4082&article=989&mode=pdf

Gudmundsdottir, G. B. (2010b). When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language. *Information Technology for Development, 16*(3), 174 - 190.

Gudmundsdottir, G. B., & Brock-Utne, B. (2010). An exploration of the importance of piloting and access as action research. *Journal of Educational Action Research, 18*(3), 359-372.

Gudmundsdottir, G. B., & Jakobsdottir, S. (2009). A digital divide: Challenges and opportunities for learners and schools on each side. In H. Holmarsdottir & M. O'Dowd (Eds.), *Nordic voices. Teaching and researching comparative and international education in the Nordic countries* (pp. 173-201). Rotterdam: Sense Publishers.

Gunkel, D. J. (2003). Second thoughts: Toward a critique of the digital divide. *New Media & Society, 5*(4), 499-522.

Gyekye, K. (1997). Philosophy, culture, and technology in the postcolonial. In E. C. Eze (Ed.), *Postcolonial African philosophy: A critical reader* (pp. 25-44). Oxford: Blackwell.

Habermas, J. (1987). *Knowledge and human interests*. Cambridge: Polity press.

Hacking, I. (1995). The looping effects of human kinds. In D. Sperber, D. Premack & A. J. Premack (Eds.), *Causal cognition. A multidisciplinary design* (pp. 351-394). Oxford: Clarendon press.

Hannerz, U. (1992). *Cultural complexity: studies in the social organization of meaning*. New York: Columbia University Press.

Harding, S. (1997). Is modern science an ethnoscience? Rethinking epistemological assumptions. In E. C. Eze (Ed.), *Postcolonial African philosophy. A critical reader* (pp. 45-71). Oxford: Blackwell.

Harvey, L. (1990). *Critical social research*. London: Unwin Hyman.

Hatch, J. A. (2002). *Doing qualitative research in education settings*. Albany: State University of New York.

Held, D. (1980). *Introduction to critical theory: Horkheimer to Habermas*. Cambridge: Polity Press.

Heugh, K. (2000). The case against bilingual and multilingual education in South Africa. *PRAESA Occasional Papers No. 6*. Cape Town: PRAESA.

Heugh, K. (2003). *Language policy and democracy in South Africa: The prospects of equality within rights-based policy and planning*. Stockholm: Centre for Research on Bilingualism, Stockholm University.

Hodgkinson-Williams, C., Sieborger, I., & Terzoli, A. (2007). Enabling and constraining ICT practice in secondary schools: Case studies in South Africa. *International Journal of Knowledge and Learning, 3*(2-3), 171-190.

Holderness, B. (2006). Toward bridging digital divides in rural (South) Africa. In D. Buckingham & R. Willet (Eds.), *Digital generations. Children, young people, and new media* (pp. 251-272). Mahwah, N.J.: Lawrence Erlbaum.

Holmarsdottir, H. (2005). *Literacy in two languages? Implementing the Language in Education Policy (LiEP) in South African primary schools.* Unpublished doctoral dissertation, University of Oslo, Oslo, Norway.

Howcroft, D., & Trauth, E. M. (2005). *Handbook of critical information systems research : Theory and application*. Northampton, Mass.: Edward Elgar.

Howie, S. J., Muller, A., & Paterson, A. (2005). *Information and communication technologies in South African secondary schools*. Cape Town: HSRC Press.

Hoy, D. C., & McCarthy, T. (1994). *Critical theory*. Oxford: Blackwell.

Hunt, F. (2007). *Schooling citizens: A study of policy in practice in South Africa.* University of Sussex, Brighton.

Internet World Statistics. (2010a). Inernet usage in Europe. Retrieved August 26, 2010, from http://www.internetworldstats.com/stats4.htm#europe

Internet World Statistics. (2010b). Internet usage statistics for Africa. Retrieved August 26, 2010, from http://www.internetworldstats.com/stats1.htm#africa

Internet World Statistics. (2010c). Internet world users by language. Retrieved August 26, 2010, from http://www.internetworldstats.com/stats7.htm

Internet World Statistics. (2010d). Surfing and site guide. Retrieved August 25, 2010, from http://www.internetworldstats.com/surfing.htm

Internet World Statistics. (2010e). World internet users and population statistics. Retrieved September 15, 2010, from http://www.internetworldstats.com/stats.htm

Jackson, L. A., Zhao, Y., Kolenic, A. I., Fitzgerald, H. E., Harold, R., & Von Eye, A. (2008). Race, gender, and information technology use: The new digital divide. *Cyberpsychology & Behavior, 11*(4), 437-442.

Jakobsdottir, S. (1996). *Elementary school computer culture: Gender and age differences in student reactions to computer use.* The University of Minnesota, Minnesota.

Jakobsdottir, S. (2008). School computer culture: Ongoing series of studies on computer use of Icelandic children and adolescents, their computer-related attitudes and skills. Retrieved April 22, 2010, from http://soljak.khi.is/computerculture/

James, J. (2003). *Bridging the global digital divide*. Cheltenham: Edward Elgar.

James, J. (2009). From the relative to the absolute digital divide in developing countries. *Technological Forecasting and Social Change, 76*(8), 1124-1129.

Jansen, J. D., & Christie, P. (Eds.). (1999). *Changing curriculum: Studies on outcomes-based education in South Africa*. Cape Town, South Africa: Juta.

Jardine, G. M. (2005). *Foucault & education*. New York: Peter Lang.

Jennings, M. K., & Zeitner, V. (2003). Internet use and civic engagement - A longitudinal analysis. *Public Opinion Quarterly, 67*(3), 311-334.

Jensen, M. (2003). The current status of information and communications technologies in Africa. In J. O. Okpaku (Ed.), *Information and communication technologies for African development* (pp. 55-78). New York: UN ICT task force.

Johnson, W. R. (1982). Education: Keystone of apartheid. *Anthropology and Education Quarterly, 13*(3), 214-237.

Joseph, M. K., & Andrew, T. N. (2009). *Information and communication technology policy imperatives for rural women empowerment: Focus on South Africa.* Paper presented at the 9th IEEE Africon Conference, Nairobi, Khenya.

Kanwar, A. (2007, 27. September). *Digital divide or digital dividend? Postcard from the South.* Paper presented at the 12th Cambridge International Conference on Open and Distance Learning, Cambridge.

Karchmer, R. A. (2001). The journey ahead: Thirteen teachers report how the internet influences literacy and literacy instruction in their K12 classrooms. *Reading Research Quarterly, 36*, 442-466.

Kemmis, S. (2006). Participatory action research and the public sphere. *Educational Action Research, 14*(4), 459-476.

Kemmis, S., & McTaggart, R. (2005). Participatory action research. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3 ed., pp. 559-603). Thousand Oaks, California: Sage Publications.

Keniston, K. (2001a). Grassroot ICT projects in India. *Social implications of computers in developing countries, 11*(3), 2-7.

Keniston, K. (2001b). Language, power and software In C. Ess (Ed.), *Culture, technology, communication. Towards an intercultural global village*. New York: State University of New York Press.

Keniston, K. (2004). The four digital divides. In K. Keniston & D. Kumar (Eds.), *IT experience in India. Bridging the digital divide* (pp. 11-36). New Dehli, India: Sage.

Keniston, K., & Kumar, D. (Eds.). (2004). *IT experience in India: Bridging the digital divide*. New Delhi, India: Sage Publications.

Khan, F., & Ghadially, R. (2010). Empowerment through ICT education, access and use: A gender analysis of muslim youth in India. *Journal of International Development, 22*(5), 659-673.

Khanya. (2010). General information. Retrieved October 15, 2010, from http://www.khanya.co.za/projectinfo/?catid=2

Kivilu, M. w., Diko, M., & Mmotlane, R. (2010). South Africans´ attitudes to social integration in schools. In B. Roberts, M. w. Kivilu & Y. D. Davids (Eds.), *South African social attitudes: The 2nd report reflections on the age of hope*. Cape Town: HSRC.

Klees, S. J. (2008). Growth, development, EFA, and the MDGs. *NORRAG news, 40*(May), 50-52. Retrieved from http://www.norrag.org/issues/download/NN/40.pdf?PHPSESSID=04128c6359f52bc0287e05ca7cd6b0c6

Korpela, J. (2003). English - the universal language on the internet? Retrieved March 10, 2006, from http://www.cs.tut.fi/~jkorpela/lingua-franca.html

Kreutzer, T. (2008). *Assessing cell phone usage in a South African township school*. Paper presented at the EMERGE. Retrieved from http://emerge2008.net/access/content/group/emerge2008/PresentationFiles/Kreutzer/Cell%20Phone%20Usage.pdf

Krumsvik, R. J. (2008). Situated learning and teachers' digital competence. *Education and Information Technologies, 13*(4), 279-290.

Kubow, P. K. (2008). Developing citizenship education curriculum cross-culturally. A democratic approach with South African and Kenyan educators. In E. D. Stevick & B. A. U. Levinson (Eds.), *Advancing democracy through education? U.S. influence abroad and domestic practises* (pp. 159-178). Charlotte, NC: IAP.

Kuhn, T. S. (1996). *The structure of scientific revolutions* Chicago: University of Chicago.

Kuttan, A., & Peters, L. (2003). *From digital divide to digital opportunity*. Oxford: The Scarecrow Press Inc.

Kvasny, L., & Hales, K. D. (2010). The internet, black identity, and the evolving discourses of the digital divide. In E. Ferro, Y. K. Dwivedi, J. R. Gil-Garcia & M. D. Williams (Eds.), *Handbook of research on overcoming digital divides. Constructing an equitable and competitive information society* (Vol. I, pp. 260-277). Hershey: Information science reference.

Kwaa Prah, K., & Brock-Utne, B. (Eds.). (2009). *Multilingualism - An African advantage. A paradigm shift in African languages of instruction policies*. Cape Town: CASAS.

Langa, Z., Conradie, P., & Roberts, B. (2006). Slipping through the net: Digital and other communication divides within South Africa. In U. Pillay, B. Roberts & S. Rule (Eds.), *South African social attitudes. Changing times, diverse voices* (pp. 131-149). Cape Town: HSRC.

Leach, J. (2005). Do new information and communication technologies have a role to play in achieving quality professional development for teachers in the global south? *The Curriculum Journal, 16*(3), 293-329.

Leys, C. (2005). The rise and fall of development theory. In M. Edelman & A. Haugerud (Eds.), *The anthropology of development and globalization. From classical political economy to contemporary neoliberalism*. Malden, MA: Blackwell.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lofland, J., & Lofland, L. H. (1984). *Analyzing social settings*. Belmont, CA: Wadsworth.

LOITASA. (2010). Language of instruction in Tanzania and South Africa.   Retrieved May 15, 2010, from http://www.loitasa.org/about.html

Lor, P. J., & Britz, J. (2010). To access is not to know: A critical reflection on A2K and the role of libraries with special reference to sub-Saharan Africa. *Journal of Information Science, 36*(5), 655-667.

Loveless, A., & Ellis, V. (Eds.). (2005). *ICT, pedagogy and the curriculum*. London: Routledge/Falmer.

Madon, S., Reinhard, N., Roode, D., & Walsham, G. (2009). Digital inclusion projects in developing countries: processes of institutionalization. *Information Technology for Development, 15*(2), 95-107.

Main, L. (2002). The global information infrastructure: empowerment or imperialism? *Third World Quarterly, 22*(1), 83-97.

Mair, L. (1984). *Anthropology and development*. Houndmills, UK: Macmillan Education.

Makalela, L. (2005). "We speak eleven tongues" Reconstructing multilingualism in South Africa. In B. Brock-Utne & R. Hopson (Eds.), *Languages of instruction for African emancipation: Focus on postcolonial contexts and considerations* (pp. 147-175). Cape Town: CASAS.

Makhaya, G., & Roberts, S. (2003). Telecommunications in developing countries: reflections from the South African experience. *Telecommunications Policy, 27*, 41-59.

Maldonado, E. A., Pogrebnyakov, N. A., & van Gorp, A. F. (2006). ICT policies as a means to inhibit social exclusion: The South African case. In E. M. Trauth, D. Howcroft, T. Butler, B. Fitzgerald & J. I. DeGross (Eds.), *Social inclusion: Societal and organizational implications for information systems* (Vol. 208, pp. 137-150). New York: Springer.

Mapi, T. (2010, October 15). African languages are cool, ok? *Mail & Guardian online*. Retrieved from http://www.mg.co.za/article/2010-10-15-african-languages-are-cool-ok

Martin, A. (2006). A European framework for digital literacy. *Nordic Journal of Digital Literacy, 2*(1), 151-161.

Mazrui, A. M. (2003). *English in Africa: After the cold war*. Clevedon: Multilingual Matters.

McLaren, P. (2009). Critical pedagogy: A look at the major concepts. In A. Darder, M. P. Baltodano & R. D. Torres (Eds.), *The critical pedagoy reader* (2nd ed., pp. 61-83). New York: Routledge.

McLaren, P. (Ed.). (2006). *Rage and hope. Interviews with Peter McLaren on war, imperialism and critical pedagogy*. New York: Peter Lang.

Mda, T. (2004). Multilingualism and education. In L. Chisholm (Ed.), *Changing class. Education and social change in post apartheid South Africa* (pp. 177-194). Cape Town, South Africa: HSRC Press.

Mertens, D. M., Bledsoe, K. L., Sullivan, M., & Wilson, A. (2010). Utilization of mixed methods for transformative purposes. In A. Tashakkori & C. Teddlie (Eds.), *Mixed methods in social and behavioral research* (pp. 193-214). Sage: Thousand Oaks.

Mesthrie, R. (2002). *Language in South Africa*. Cambridge: Cambridge University Press.

Molina, A. (2003). The digital divide: The need for a global e-inclusion movement. *Technology Analysis & Strategic Management, 15*(1), 137-152.

Morrow, R. A., & Brown, D. D. (1994). *Critical theory and methodology*. Thousand Oaks: SAGE.

Morrow, R. A., & Torres, C. A. (1995). *Social theory and education. A critique of theories of social and cultural reproduction*. New York: State University of New York.

Morse, J. M. (2010). Principles of mixed methods and multimethod research design. In A. Tashakkori & C. Teddlie (Eds.), *SAGE handbook of mixed methods in social and behavioral research* (second ed., pp. 339-352). Thousand Oaks: Sage.

Motala, S. (1995). Surviving the system: a critical appraisal of some conventional wisdoms in primary education in South Africa. *Comparative Education, 31*(2), 161-180.

Motala, S., Dieltiens, V., & Sayed, Y. (2010). Physical access to schooling in South Africa: Mapping dropout, repetition and age-grade progression in two districts. *Comparative Education, 45*(2), 251-263.

Murray, S. (2002). Language issues in South African education: an overview. In R. Mesthrie (Ed.), *Language in South Africa* (pp. 434-449).

Muwanga-Zake, J. W. F. (2007). Introducing educational computer programmes through evaluation: A case in South African disadvantaged schools. *International Journal of Education and Development using ICT, 3*(3), 30-48.

Nagda, B. R. A., Gurin, P., & Lopez, G. E. (2003). Transformative pedagogy for democracy and social justice. *Race, ethnicity and education, 6*(2), 165-191.

Nathan, D. (2000). Plugging in indigenous knowledge: Connections and innovations. *Australian Aboriginal Studies 2000*(2), 39-47.

Niglas, K., Kaipainen, M., & Kippar, J. (2008). Multi-perspective exploration as a tool for mixed methods research. In M. M. Bergman (Ed.), *Advances in mixed methods research* (pp. 172-187). Thousand Oaks: Sage.

Nolan, R. W. (2002). *Development anthropology: Encounters in the real world*. Boulder, Colorado: Westview Press.

Nomlomo, V. (2006). Parents' choice of the medium of instruction in science: A case of one primary school in the Western Cape, South Africa. In B. Brock-Utne, Z. Desai & M. Qorro (Eds.), *Focus on fresh data on the language of instruction debate in Tanzania and South Africa* (pp. 112-137). Cape Town, South Africa: African Minds.

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the Internet worldwide*. Cambridge: Cambridge University Press.

Nyambe, J., & Griffiths, J. (1999). Deconstructing educational dependency: Insights from a Namibian college of teacher education. *Reform Forum, 1999*(10). Retrieved from http://www.nied.edu.na/nied/pub/journals/journal10/Journal%2010%20Article%20 3.pdf

Olatokun, W. M. (2008). Gender and national ICT policy in Africa: Issues, strategies, and policy options. [Article]. *Information Development, 24*(1), 53-65.

Osborn, D. (2010). *African languages in a digital age. Challenges and opportunities for indigenous language computing*. Cape Town: HSRC Press.

Oyedemi, T. (2009). *Social inequalities and ICT policies in developing countries: A case of South Africa*. Paper presented at the International Communication Association. Retrieved from http://www.allacademic.com/meta/p300768_index.html

Palmer, R. (2010). ICT4D and the Siyakhula Living Lab: an anthropological contribution to digital development. [Article]. *Anthropology Southern Africa, 33*(1-2), 19-32.

Paolillo, J. C. (2007). How much multilingualism? Language diversity on the internet. In B. Danet & S. C. Herring (Eds.), *The multilingual Internet. Language, culture, and communication online*. Oxford, England: Oxford University Press.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park: Sage.

Peet, R., & Hartwick, E. (2009). *Theories of development: contentions, arguments, alternatives* (2nd ed.). New York: Guilford Press.

Pieterse, J. N. (2010). *Development theory*. London: SAGE.

Pillay, U., Roberts, B., & Rule, S. (Eds.). (2006). *South African Social Attitudes. Changing Times, Diverse Voices*. Cape Town: Human Sciences Research Council.

Plüddemann, P., Mati, X., & Mahlahela-Thusi, B. (2000). *Problems and possibilities in multilingual classrooms in the Western Cape*. Cape Town: PRAESA.

Postlethwaite, T. N. (1988). Preface. In T. N. Postlethwaite (Ed.), *The encyclopaedia of comparative education and national systems of education*. Oxford: Pergamon Press.

Prinsloo, M., & Walton, M. (2008). Situated responses to the digital literacies of electronic communication in marginal school settings. In N. Pecora, E. Osei-Hwere & U.Carlsson (Eds.), *Yearbook 2008: Youth and media* (Vol. 2, pp. 99-116). Stockholm, Sweden: International Clearinghouse on Children, Youth and Media.

Rassool, N. (1999). *Literacy for sustainable development in the age of information*. Clevedon: Multilingual matters.

Rassool, N. (Ed.). (2007). *Global issues in language, education and development: Perspectives from postcolonial countries*. Clevedon, England: Multilingual Matters.

Raubenheimer, J., & van Niekerk, J. (2002). Recent developments in interlending and document supply with a focus on the South African situation. *Interlending & Document Supply, 30*(1), 17-24.

Reagan, T. (2005). *Non-western educational traditions. Indigenous approaches to educational throught and practise* (3 ed.). New York: Routhledge.

Robeyns, I. (2005). The capability approach: a theoretical survey. *Journal of Human Development, 6*(1), 93-117.

Rostow, W. W. (1960). *The stages of economic growth*. Cambridge: Cambridge University Press.

Sadler, M. (1979). How far can we learn anything of practical value from the study of foreign systems of education. In J. H. Higginson (Ed.), *Selections from Michael Sadler* (pp. 48-51). Liverpool: Dejall & Meyorre International publishers.

SADoC. (2000). *Green paper on electronic commerce for South Africa*. Pretoria: South African Department of Communications.

Said, E. W. (2003). *Orientalism*. London: Penguin Books.

Saito, M. (2003). Amartya Sen's capability approach to education: A critical exploration. *Journal of Philosophy of Education, 37*(1), 17-33.

Saldanha, D. (2005). Literacy-communication and urbanisation-development. In A. Rogers (Ed.), *Urban literacy: Communication, identity and learning in development context*. Hamburg: UNESCO.

Sayed, Y. (1998). *The segregated information highway: Information literacy in higher education*. Cape Town: University of Cape Town Press.

Scheuermann, F., & Francesc, P. (2009). Introduction. Assessing the effects of ICT in education: Indicators, criteria and benchmarks for international comparisons. In F. Scheuermann & P. Francesc (Eds.) Available from http://titania.sourceoecd.org/vl=943775/cl=11/nw=1/rpsv/ij/oecdthemes/99980029/v2010n37/s1/p1l

Selwyn, N. (2007). The use of computer technology in university teaching and learning: A critical perspective. *Journal of Computer Assisted Learning, 23*(2), 83-94.

Selwyn, N., & Facer, K. (2010). Beyond digital divide: Toward an agenda for change. In E. Ferro, Y. K. Dwivedi, J. R. Gil-Garcia & M. D. Williams (Eds.), *Overcoming digital divides. Constructing an equitable and competitive information society* (Vol. I, pp. 1-20). Hershey: Information science reference.

Semali, L. M. (2009). Indigenous pedagogies and language for peace and development. In B. Brock-Utne & G. Garbo (Eds.), *Language and power. The implications of language for peace and development* (pp. 196-207). Dar es Salaam: Mkuki na Nyota.

Sen, A. (1992). *Inequality re-examined*. Oxford: Oxford University Press.

Sen, A. (1997). Human capital and human capability. *World Development, 25*(12), 1959-1961.

Sen, A. (1999a). *Commodities and capabilities*. Oxford: Oxford University Press.

Sen, A. (1999b). *Development as freedom*. Oxford: Oxford University Press.

Sen, A. (2003). The importance of basic education. Full text of Amartya Sen's speech to the Commonwealth education conference *The Guardian,* (October 28). Retrieved from http://people.cis.ksu.edu/~ab/Miscellany/basiced.html

Shacklock, G., & Smyth, J. (Eds.). (1998). *Being reflexive in critical educational and social research*. New York: Routledge Falmer.

Silva, P. (2006). South African english: Oppressor or liberator? Retrieved March 22, 2006, from http://www.ru.ac.za/affiliates/dsae/MAVEN.HTML

Singer, H. (1970). Dualism revisited: A new approach to the problems of the dual society in developing countries. *Journal of Development Studies, 7*(1), 60-75.

Singh, S. (2010). The South African 'information society', 1994-2008: Problems with policy, legislation, rhetoric and implementation. [Article]. *Journal of Southern African Studies, 36*(1), 209-227.

Smith, L. T. (1999). *Decolonizing methodologies: Research and indigenous peoples*. London: Zed Books.

Smyth, J., & Shacklock, G. (1998). Behind the 'cleansins' of socially critical research accounts. In G. Shacklock & J. Smyth (Eds.), *Being reflexive in critical educational and social research* (pp. 1-12). New York: Routledge Falmer.

So, A. Y. (1990). *Social change and development: modernization, dependency, and world-system theories*. Newbury Park, California: Sage.

Soudien, C. (2004). 'Constituting the class': An analysis of the process of 'integration' in South African schools. In L. Chisholm (Ed.), *Changing class. Education and social change in post-apartheid South Africa* (pp. 89-114). Cape Town: HSRC press.

Soudien, C., & Baxen, J. (1997). Transformation and outcomes-based education in South Africa: Opportunities and challenges. *Journal of Negro Education, 66*(4), 449-459.

South African Government. (1996). Constitution of the Republic of South Africa. . Retrieved January 10, 2008, from http://www.info.gov.za/documents/constitution/1996/index.htm

Spivak, G. C. (1996). More on power/knowledge. In D. Landry & G. McLean (Eds.), *Selected works of Gayatri Chakravorty Spivak* (pp. 141-174). London: Routledge.

Statistics South Africa. (2001). Census 2001. Primary tables Western Cape. Retrieved October 13, 2010, from http://www.statssa.gov.za/census01/html/WCPrimary.pdf

Statistics South Africa. (2007). Community survey 2007. Retrieved September 28, 2010, from http://www.statssa.gov.za/community_new/content.asp

Statistics South Africa. (2008). StatsOnline. The digital face of South Africa. Retrieved January 10, 2008, from http://www.statssa.gov.za/

Steinmueller, E. (2001). ICTs and the possibilities for leapfrogging by developing countries. *International Labour Review, 140*(2), 193-210.

Strauss, A. C., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. London: Sage.

Su, B. (2009). Effective technology integration: Old topic, new thoughts. *International Journal of Education and Development using ICT, 5*(2). Retrieved November 20, 2009, from http://ijedict.dec.uwi.edu/viewarticle.php?id=620&layout=html),

Sutton, R. E. (1991). Equity and computers in the schools: A decade of research. *Review of Educational Research, 61*, 475-503.

Swarts, P. (n.y.). Perspectives on ICT4E in the developing world. 1-13. Retrieved from http://www.gesci.org/assets/files/Perspectives%20on%20%20ICT4E%20in%20developing%20world.pdf

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: combining qualitative and quantitative approaches*. Thousand Oaks, Calif.: Sage.

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research*. Thousand Oaks: Sage.

Tripp, D. (1998). Critical incidents in action inquiry. In G. Shacklock & J. Smyth (Eds.), *Being reflexive in critical educational and social research* (pp. 36-49). New York: Routledge Falmer.

Tucker, V. (1999). The myth of development: A critique of Eurocentric discourse. In R. Munck & O. H. D (Eds.), *Critical Development Theory - Contributions to a new paradigm* (pp. 1-26). London: ZED

UNDP. (2000). *South Africa: Transformation for human development 2000*. Pretoria: UNDP.

UNESCO. (1953). *The use of vernacular languages in education*. Paris: UNESCO.

UNESCO. (2000). Education for All. Dakar Framework for Action. Retrieved 18th January, 2008, from http://www.unesco.org/education/efa/ed_for_all/dakfram_eng.shtml

UNESCO. (2002a). UNESCO universal declaration on cultural diversity. Retrieved September 2, 2010, from http://www.unesco.org/education/imld_2002/unversal_decla.shtml#2.

UNESCO. (2005). UNESCO convention on the protection and promotion of the diversity of cultural expressions Retrieved September 1, 2010, from http://portal.unesco.org/en/ev.php-URL_ID=31038&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO. (2010, February 12, 2010). Cultural diversity programming lens general framework. Retrieved September 1, 2010, from http://www.unescobkk.org/index.php?id=8328

UNESCO (Ed.). (2002b). *Information and communication technology in education. A curriculum for schools and programme of teacher development*. Paris: UNESCO.

United Nations. (2000). UN Millenium Development Goals. Retrieved 21. January 2008, from http://www.un.org/millenniumgoals/

Unterhalter, E., & Brighouse, H. (2010). Distribution of what for social justice in education? The case of Education for All 2015. In M. Walker & E. Unterhalter (Eds.), *Amartya Sen´s capability approach and social justice in education* (pp. 67-87). Hampshire: Palgrave Macmillan.

Unwin, T. (Ed.). (2009). *ICT4D information and communication technology for development*. Cambridge, England: Cambridge University Press.

van Audenhove, L., Burgelman, J.-C., Nulens, G., & Cammaerts, B. (1999). Information society policy in the developing world: a critical assessment. *Third World Quarterly, 20*(2), 387-404.

van Binsbergen, W. (2004). Can ICT belong in Africa, or is ICT owned by the North Atlantic region? In W. van Binsbergen & R. van Dijk (Eds.), *Situating Globality. African agency in the appropriation of global culture* (pp. 107-146). Leiden: Brill.

van de Bunt-Kokhuis, S. (2001). Making Southern Universities Web-enabled: from leapfrogging to antelope jumping *Intercultural Education, 12*(2), 125-133.

van Dijk, J. (1999). *The network society: Social aspects of new media*. Thousand Oaks, CA: SAGE.

van Dijk, J. (2005). *The deepening divide. Inequality in the information society*. Thousand Oaks: SAGE.

van Dijk, J., & van Deursen, A. (2010). Inequalities of digital skills and how to overcome them. In E. Ferro, Y. K. Dwivedi, J. R. Gil-Garcia & M. D. Williams (Eds.), *Overcoming digital divides. Constructing an equitable and competitive information society* (pp. 278-291). Hershey: Information science reference.

van Grasdorff, E. (2004). *African Renaissance and discourse ownership in the Information Age*. Hamburg: Lit Verlag.

van Wyk, K. (2007). Gadget Graveyards. *Khanya. Education through technology*.

van Wyk, K. (2010). Are you on life support? *Khanya. Education through technology, 2010*(16), 9.

Von Glaserfeld, E. (1991). Knowing without metaphysics: aspects of the radical constructivist position. In F. Steier (Ed.), *Research and reflexivity* (pp. IV, 257 s.). London: Sage.

Walker, M., & Unterhalter, E. (2007). The capability approach: Its potential for work in education. In M. Walker & E. Unterhalter (Eds.), *Amartya Sen´s capability approach and social justice in education* (pp. 1-18). New York: Palgrave Macmillan.

Wallerstein, I. (1979). *The politics of the world economy*. Cambridge: Cambridge University Press.

Ward, T. (2010). Critical Theory Retrieved May 15, 2010, from http://www.tonywardedu.com/content/section/16/120/

Warschauer, M. (2003a). Dissecting the "digital divide": A case study in Egypt *The Information Society, 19*(4), 297-304.

Warschauer, M. (2003b). Reconceptualizing the digital divide. *First Monday* Retrieved February 12, 2006, from http://www.firstmonday.org/issues/issue7_7/warschauer/index.html

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: MIT Press.

Wasserman, H. (2002). Between the local and the global: South African languages and the internet. *African and Asian Studies, 1*(4), 303-321.

Watson, D. (2006). Understanding the relationship between ICT and education means exploring innovation and change. *Education and Information Technologies, 11*(3), 199-216.

Western Cape Education Department. (2003, 28 January 2008). Information and Communication Technologies (ICT) in WCED schools. from http://wced.wcape.gov.za/home/projects/school_it.html

Western Cape Education Department. (2010). Strategic Plan for the fiscal year 2010-2014. Retrieved December 10, 2010, from http://wced.wcape.gov.za/documents/stratplan10/SP2010-English-partB.pdf

Wilson, E. J. (2004). *The information revolution and developing countries*. Cambridge, MA: MIT Press.

Wilson, E. J., & Wong, K. (2003). African information revolution: a balance sheet. *Telecommunications Policy, 27*, 155-177.

Wilson, F. (2001). Employment, education, and the economy. *South Africa Survey 2001/2002* (pp. 3-32). Johannesburg: South African Institute of Race Relations.

Wolpe, H. (1988). *Race, class & the Aparatheid state*. Paris: UNESCO press.

World Summit on the Information Society. (2003). Plan of action. Retrieved November 5, 2010, from http://www.itu.int/wsis/docs/geneva/official/poa.html

Yano, Y. (2001). World englishes in 2000 and beyond. *World Englishes, 20*(2), 119-131.

Yu, L. (2006). Understanding information inequality: Making sense of the literature of the information and digital divides. *Journal of librarianship and information science, 38*(4), 229-252.

Zegeye, A., & Harris, R. (2002). Media, identity and the public sphere in post-apartheid South Africa: An introduction. *African and Asian Studies, 1*(4), 239-263.

Zheng, Y. (2009). Different spaces for e-development: What can we learn from the capability approach? *Information Technology for Development, 15*(2), 66-82.

Appendices

Computer Access and Attitudes

Please spend a few minutes to contribute to this survey, which explores people's access and views of Information and Communication Technology (ICT).
Within this survey the term ICT is taken to mean computer related technologies (eg computers, the Internet) but excluding tape recorders, video tape players, Overhead Projectors etc.

The survey is a part of a doctoral project conducted by Greta Gudmundsdottir from the University of Oslo in Norway. Any recommendation, comments or questions should be sent to
g.b.gudmundsdottir@ped.uio.no

General questions

1. I am a: ☐ girl ☐ boy

2. I attend grade: ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10

3. My mother -tongue is: ☐ Xhosa ☐ Afrikaans ☐ English ☐ Ndebele

☐ Zulu ☐ Sepedi (Northern Sotho) ☐ Sotho (South Sotho) ☐ Tswana

☐ Swati ☐ Venda ☐ Tsonga ☐ other, please specify:

4. My ethnic background is: ☐ Black ☐ Coloured ☐ White ☐ Indian

Computer Access

5. a. Do you have a computer at home? (do not count computer games, Nintendo, gameboy etc.)

☐ yes ☐ no

b. Do you have Internet access at home?

☐ yes ☐ no ☐ don´t know

6. Please describe your *LAST* use of computer (PC, Mac)/the Internet

Last time I used a computer/the Internet was:
☐ more than one week ago   ☐ less than one week ago

I used it to:
☐ learn/study   ☐ play a game   ☐ find information   ☐ communicate with others   ☐ other, please specify: _____

I was staying:
☐ at home   ☐ at a friends house   ☐ in school   ☐ at the library   ☐ at my parents workplace   ☐ at an Internet Café   ☐ elsewhere, please specify: _____

My Computer and Internet use

7. When I use computer or the Internet I am most frequently:
☐ at home   ☐ at a friends house   ☐ in school   ☐ at the library   ☐ at my parents workplace   ☐ at an Internet Café   ☐ elsewhere, please specify: _____

8. Do you use computer and/or the Internet *OUTSIDE* the school

☐ yes   ☐ no

9. How many **hours** a week do you use computer and/or the Internet outside the school?

non	Less than 2 hours	2-5 hours	6-9 hours	10 -15 hours	16-20 hours	21 hours or more
☐	☐	☐	☐	☐	☐	☐

10. Do you use computer and/or the Internet *IN SCHOOL*?

☐ yes ☐ no

11. How many **hours** a week do you use computer and/or the Internet in school?

non	Less than 2 hours	2-5 hours	6-9 hours	10-15 hours	16-20 hours	21 hours or more
☐	☐	☐	☐	☐	☐	☐

12. Mark which programmes you use (or you have used) *at home/outside school?*

Computer software and the Internet use at home/outside school	Home/Outside School
Word processing (e.g. Word, Word-Perfect)	☐
Presentation programmes/Overheads (e.g. Powerpoint)	☐
Data calculations/spreadsheets (e.g. Excel)	☐
Computer games	☐
Educational software (to study particular subject e.g. computing skills, grammar etc.)	☐
Web design (e.g. Frontpage, Dreamweaver, NVU)	☐
Internet browser (e.g. Netscape, Internet Explorer)	☐
Educational platforms on the Internet (e.g. WebCT, Classfronter)	☐
Internet *E-mail* (e.g. Hotmail, Yahoo, Outlook, Eudora)	☐
Internet *chat*	☐
Internet *conferences, discussion forums*	☐
Internet *blog*	☐
Internet *games*	☐

13. Mark which programmes you use (or you have used) *in school?*

Computer software and the Internet use in school	In School
Word processing (e.g. Word, Word-Perfect)	☐
Presentation programmes/Overheads (e.g. Powerpoint)	☐
Data calculations/spreadsheets (e.g. Excel)	☐
Computer games	☐
Educational software (to study particular subject e.g. computing skills, grammar etc.)	☐
Web design (e.g. Frontpage, Dreamweaver, NVU)	☐
Internet browser (e.g. Netscape, Internet Explorer)	☐
Educational platforms on the Internet (e.g. WebCT, Classfronter)	☐
Internet *E-mail* (e.g. Hotmail, Yahoo, Outlook, Eudora)	☐
Internet *chat*	☐
Internet *conferences, discussion forums*	☐
Internet *blog*	☐
Internet *games*	☐

Use of computers at school

14. In what subjects do you use computers/the Internet in your class (group)?

☐ English	☐ Afrikaans	☐ Xhosa
☐ Natural/General Science	☐ History	☐ Geography
☐ Religious Instruction	☐ Art	☐ Life Orientation
☐ Information and Communication	☐ Human/Social Science	☐ other, please specify _____
☐ other, please specify _____	☐ other, please specify _____	☐ other, please specify _____

15. Do you have a special subject teaching you how to use computers and the Internet?

☐   ☐

yes   no

16. Do you know how many computers your school has for students to use? _____(number)

17. Where do you use a computer at school?

☐ in a computer laboratory

☐ in the classroom

☐ at the library

☐ elsewhere, please specify:

_____

Computer skills and attitudes

18. I am able to:

☐ Use word processing such as Word or Word Perfect to write text

☐ Save a document

☐ Delete documents or folders

☐ Print a document

☐ Install a computer software

☐ Download a computer software from the Internet

☐ Do programming (with for example Logo, Virtual BASIC, HTML)

☐ Connect to the Internet

☐ Make a webpage

☐ Make presentations/overheads (with for example Powerpoint)

☐ Calculate on the computer (with for example Excel)

☐ Find certain information on the Internet

☐ Use E-mail to send messages

☐ Use Chat channels to chat with others

☐ Use Discussion forums to communicate with others

☐ To "blog" on the Internet

Other things, please specify:

☐ _____

_____

19. Attitudes to computers/the Internet	totally disagree	partly disagree	undecided	partly agree	totally agree
I dislike using computers	☐	☐	☐	☐	☐
I think computer skills are important for the future	☐	☐	☐	☐	☐
I find it exciting to use computers	☐	☐	☐	☐	☐
I find computers important tool for school and work	☐	☐	☐	☐	☐
I am very good in using computers in many different ways	☐	☐	☐	☐	☐
I like trying out new things with the computer	☐	☐	☐	☐	☐
I like using computers to do useful things	☐	☐	☐	☐	☐
I feel uncomfortable when I am using computer/software that I have not used before	☐	☐	☐	☐	☐
I find it difficult to understand information on the Internet when it is in English	☐	☐	☐	☐	☐
I would prefer having information on the Internet in my mother tongue	☐	☐	☐	☐	☐
I find it difficult to express my views in class in English	☐	☐	☐	☐	☐
I do not have difficulties understanding instructions on the computer when they are in English	☐	☐	☐	☐	☐
Language is a hindrance for me when using the Internet	☐	☐	☐	☐	☐

20. What is the language of the **majority** of assignments and/or webpages when you use computers and the internet: _____ (name language)

Thank you very much for participating!

Interview guide for learners

What is the language you use at home, with friends, at school.
Parents mother tongue
Ethnic group
Occupation of your parents (guardian)

Use of computers/the Internet <u>at school</u>
Your experience using at school
Why learn on computers
Difference with normal classroom lessons
Frequency of use at school
Difficulties/challenges when using

Computer and Internet use <u>outside</u> of the school
Access at home
Describe your computer use outside of school
Frequency outside of school
What do you use the computer for
Location outside school

Cell phones - SMSes
Access to cell phone
Use of SMS
Language of SMSes

Computer skills and attitudes
Preferences when using ICT
Explain what is the Internet
Future usefulness
Your classmates and their skills
Your level of skills compared to others
What do you find challenging

Language and teaching materials
Language difficulties
Choice of language on the Internet when browsing
Expressing yourself in class
Teaching materials in mother tongue
Importance of mother tongue on the Internet
Importance of English

Other issues

Interview guide for teachers

Yourself
Name and gender,
Position and department
Mother tongue/home language
Ethnic group
Teaching experience
Language use in the classroom
Own computer/Internet use - at home – outside school
School computer use

Teachers
Computer competence at school (yourself and your colleagues)
Difference between lessons in the computer room vs. the classroom
Cooperation with other teachers or support from staff members
Training possibilities
Benefits or disadvantages for teachers
Preparation for lessons in the computer room
Selection of software
Computer integration into curriculum
The log book
Initial training from Khanya

Learners
Describe their computer use
Progress - development in their computer use
Students reactions to software and the Internet (gender, age, economic status, language, rural/urban).
Students use and language
Benefits for disadvantaged for students
Challenges for disadvantaged students
Equal opportunities
Adapting to students needs

Language and localisation
Development of African languages and ICT
Content - relevance
Status of English
Revitalising
The future

Other issues

Interview guide for other staff members and principal

Background information
History of the school.
Comparison to other schools in the district
Information about the district
ICT use at district and school level
Language situation
Your role to enable/increase the use of ICT

Access and use
School computer use
Progress – development in school computer use
Equal access
Material access at school - status
Library computer use (if library)
Scheduling – time use
Location in the curriculum and in the school
District computer use

Teachers and support
Cooperation among teachers
Number of teachers and their language profile
Teacher's competence to use ICT
Teacher's training on computers
Motivation and attitudes
Support from WCED/Khanya
Benefits and/or disadvantages

Language, teaching materials and curriculum
Adapting to students needs
Content – local languages
Language differences
Challenges
English as the lingua franca
Translation of software programmes and web pages
Software selection
Student reactions to software
Computer integration into curriculum

Other issues

Interview guide for Khanya/WCED staff

Background information
How long have you been a part of Khanya and what is your title?
Khanya in general
Information about the district
Who becomes Khanya school
District computer use - status

Teachers and support
Teacher's competence to use
Teacher's training on computers
The Khanya facilitators
Motivation and attitudes among teachers, principals
Support to schools from WCED/Khanya
Benefits and/or disadvantages

Access, software, localisation
Khanya software
Software selection
Language policy
Translation or localisation
Adapting to learners needs
Equal access
Translation of software programmes and web pages
Content
Language differences
Language as hindrance
English as the lingua franca
Computer integration into curriculum
Anything else

Monitoring and evaluating
How are school chosen
Greatest hindrance implementation
Implementation process
Monitoring
Evaluation the project
Broadening the subjects focus
The future vision
Policy

Other issues

Computers, the Internet and cell phones access and use

Please spend a few minutes to contribute to this survey.
Read the questions carefully and please try to be as accurate as you can when answering them. Notice also that there is a difference in the questions whether you are at school or outside of school (at home, with friends etc.)

General questions

Name of school: _____

1. I am a
   - ○ Boy
   - ○ Girl

2. I attend
   - ○ 5th grade
   - ○ 6th grade
   - ○ 7th grade
   - ○ Other, please specify _____

3. My mother-tongue is
   - ○ Afrikaans
   - ○ English
   - ○ Ndebele
   - ○ Sepedi (Northern Sotho)
   - ○ Sotho (South Sotho)
   - ○ Swati
   - ○ Tsonga
   - ○ Tswana
   - ○ Venda
   - ○ Xhosa
   - ○ Zulu
   - ○ Other, please specify _____

4. My ethnic background is
   - ○ Black
   - ○ Coloured
   - ○ Indian
   - ○ White
   - ○ Other, please specify _____

Access

5. Do you have a computer at home?
   (do not count computer games like Play Station, Nintendo, Gameboy etc.)

   ○ Yes

   ○ No

   ○ Don't know

6. In what month/year did you use a computer for the very first time?
   Month ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.

   Year ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.

   ○ Can not remember

7. Where were you the first time you used a computer?

   ○ At home

   ○ At a friends/relative's house

   ○ At school

   ○ At the public library

   ○ At my parents' workplace

   ○ At an Internet Café

   ○ Can not remember

   ○ Elsewhere, please specify ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.

8. Do you have Internet access at home?

   ○ Yes

   ○ No

   ○ Don't know

9. Which of the following best describes your use of the Internet?

   ○ I have not used the Internet

   ○ I am presently not using the Internet

   ○ I am presently using the Internet

10. Do you have access to a cell phone?

   ○ Yes

   ○ No

My Computer and Internet use

11. Here is a list of things people sometimes do on a computer. Please tick off those that you already know how to do.

I already know how to:

   ○ blog on the Internet

   ○ chat on the Internet

   ○ copy material (text, pictures) from the Internet

   ○ copy/download music from the Internet

   ○ design web pages

   ○ draw/design

   ○ make presentations/overheads

   ○ play computer games

   ○ play internet games

   ○ programme software

   ○ seek information on a CD Rom

   ○ seek information on the Internet

   ○ use data calculations

   ○ write text

   ○ Other, please specify ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ .

12. When I use a computer or the Internet I am most frequently:

   ○ At home

   ○ At a friend's/relative's house

   ○ At school

   ○ At the public library

   ○ At my parents' workplace

   ○ At an Internet Café

   ○ Can not remember

   ○ Elsewhere, please specify ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ .

13. Do you use a computer and/or the Internet outside of the school

   ○ Yes

   ○ No   *if no, go to question 16*

14. How often do you use a computer and/or the Internet outside the school?

○ Several times a day

○ About once a day

○ 3-5 days a week

○ 1-2 days a week

○ Every few weeks

○ Less often

○ Never

15. Here is a list of things people sometimes do on a computer. Not everyone has done these things. When you use a computer outside of school can you tell me whether you ever…?

<u>One answer in each row</u>

Yes	No	
[ ]	[ ]	blog on the Internet
[ ]	[ ]	chat on the Internet
[ ]	[ ]	copy material (text, pictures) from the Internet
[ ]	[ ]	copy/download music from the Internet
[ ]	[ ]	design web pages
[ ]	[ ]	draw/design
[ ]	[ ]	make presentations/overheads
[ ]	[ ]	play computer games
[ ]	[ ]	play Internet games
[ ]	[ ]	programme software
[ ]	[ ]	seek information on a CD Rom
[ ]	[ ]	seek information on the Internet
[ ]	[ ]	use data calculations
[ ]	[ ]	write text
		Other, please specify ....

16. Have you sent an SMS (abbreviation for short messages service) on a cell phone?

○ Yes

○ No   *if no, go to question 19*

17. How often do you send SMSes?

    ○ Several times a day
    ○ About once a day
    ○ 3-5 days a week
    ○ 1-2 days a week
    ○ Every few weeks
    ○ Less often
    ○ Never

18. In what language do you most often write your SMSes?

    ○ Afrikaans
    ○ English
    ○ Ndebele
    ○ Sepedi (Northern Sotho)
    ○ Sotho (South Sotho)
    ○ Swati
    ○ Tsonga
    ○ Tswana
    ○ Venda
    ○ Xhosa
    ○ Zulu
    ○ Other, (also if mix of languages) please specify......................................

19. Have you received an SMS?

    ○ Yes
    ○ No   *if no, go to question 21*

20. In what language do you receive most of your SMSes?
   ○ Afrikaans
   ○ English
   ○ Ndebele
   ○ Sepedi (Northern Sotho)
   ○ Sotho (South Sotho)
   ○ Swati
   ○ Tsonga
   ○ Tswana
   ○ Venda
   ○ Xhosa
   ○ Zulu
   ○ Other, (also if mix of languages) please specify⋯⋯⋯⋯⋯⋯⋯⋯⋯

Use of computers/the Internet at school

21. Do you use a computer and/or the Internet at school?
   ○ Yes
   ○ No   *if no, go to question 26*

22. How often do you use a computer and/or the Internet at school?
   ○ Several times a day
   ○ About once a day
   ○ 3-5 days a week
   ○ 1-2 days a week
   ○ Every few weeks
   ○ Less often
   ○ Never

23. Here is a list of things people sometimes do on a computer. Not everyone has done these things. When you use a computer at school can you tell me whether you ever do each one, or not. Do you ever…?

One answer in each row

Yes	No	
[ ]	[ ]	blog on the Internet
[ ]	[ ]	chat on the Internet
[ ]	[ ]	copy material (text, pictures) from the Internet
[ ]	[ ]	copy/download music from the Internet
[ ]	[ ]	design web pages
[ ]	[ ]	draw/design
[ ]	[ ]	make presentations/overheads
[ ]	[ ]	play computer games
[ ]	[ ]	play Internet games
[ ]	[ ]	programme software
[ ]	[ ]	seek information on a CD Rom
[ ]	[ ]	seek information on the Internet
[ ]	[ ]	use data calculations
[ ]	[ ]	write text
		Other, please specify ....:

24. Is computer and information technology a special subject at your school?

   ○ Yes
   ○ No

25. Where do you use a computer at school?

   ○ In the classroom, integrated in different subjects
   ○ In the computer lab
   ○ At the library
   ○ Elsewhere, please specify..

26. Here are some statements regarding computer use. Can you answer these questions with Yes or No?

<u>One answer in each row</u>

Yes **I agree**	**No** **I disagree**	
[ ]	[ ]	a. I do not like using computers
[ ]	[ ]	b. I think computer skills are important for the future
[ ]	[ ]	c. I find it exciting to use computers
[ ]	[ ]	d. I find computers important for school and work
[ ]	[ ]	e. I am very good at using computers in many different ways
[ ]	[ ]	f. I like trying out new things on the computer
[ ]	[ ]	g. I like using computers to do useful things
[ ]	[ ]	h. I feel uncomfortable when I am using software or programmes that I have not used before
[ ]	[ ]	i. I am more motivated and attentive when computers and the Internet are used in class
[ ]	[ ]	j. Using computers in class does have significant learning benefits for me

27. Here are some statements regarding computer use and language. Can you answer these questions with Yes or No?

<u>One answer in each row</u>

Yes **I agree**	**No** **I disagree**	
[ ]	[ ]	a. I find it difficult to understand information on the Internet when it is in English
[ ]	[ ]	b. I prefer having information on the Internet in my mother tongue
[ ]	[ ]	c. I find it difficult to express my views in class in English
[ ]	[ ]	d. I find it difficult in general to understand how to use computers
[ ]	[ ]	e. I do have difficulties understanding instructions on a computer when they are in English
[ ]	[ ]	f. Language is a hindrance for me when I use the Internet
[ ]	[ ]	g. I prefer having my mother tongue as the language of instruction at school

28. When you are surfing on the Internet, approximately how many of the web pages are in your mother tongue?

- ○ All of them
- ○ The majority
- ○ Half of them
- ○ The minority
- ○ None

29. How important is it for you to find information on the Internet in your mother tongue?

- ○ Very important
- ○ Rather important
- ○ Rather unimportant
- ○ Not important

30. Compared to other classmates, how would you rate your level of skills using computers and the Internet?

- ○ Beginner
- ○ Average
- ○ Above average
- ○ Excellent

31. How important do you think computer and Internet skills are for your future?

- ○ Very important
- ○ Rather important
- ○ Rather unimportant
- ○ Not important

32. What do you do in your free time - outside the school?

<u>You can answer more than one alternative</u>

- ○ Call someone
- ○ Go to a club (youth club, sports club)
- ○ Helping out at home
- ○ Listen to CDs, cassettes
- ○ Listen to the radio
- ○ Look at TV
- ○ Look at video
- ○ Meet friends
- ○ Read a book (not schoolbooks)
- ○ Read a magazine/comic strips
- ○ Read newspapers
- ○ Use a computer
- ○ Write SMS
- ○ Other, please specify ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.

33. Can you identify the main occupation of your parents' (guardian)?

Mother	Father	
[ ]	[ ]	Academic/Professional
[ ]	[ ]	Manager
[ ]	[ ]	Office/Administrator
[ ]	[ ]	Industry
[ ]	[ ]	Craft/Agriculture
[ ]	[ ]	Informal trader/Vendor
[ ]	[ ]	Handyman/Artisan
[ ]	[ ]	Informally employed/Home worker
[ ]	[ ]	Unemployed

If you are not sure which category to choose or the main occupation does not fit to any of the above, **please write the title of the work here:**

Father's main work is called: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.
Mother's main work is called: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯.

Thank you for your participation

<table>
<tr><td>Navrae
Enquiries
IMibuzo</td><td>**Dr RS Cornelissen**</td></tr>
<tr><td>Telefoon
Telephone
IFoni</td><td>**(021) 467-2286**</td></tr>
<tr><td>Faks
Fax
IFeksi</td><td>**(021) 425-7445**</td></tr>
<tr><td>Verwysing
Reference
ISalathiso</td><td>**20060713-0052**</td></tr>
</table>

Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundo leNtshona Koloni

Ms Greta Gudmundsdottir
Institute for Educational Research
Univeristy of Oslo
P.O. Box 1092
BLINDERN
Norway
N-0317

Dear Miss G. Gudmundsdottir

RESEARCH PROPOSAL: THE DIGITAL DIVIDE: A SOUTH AFRICAN CLASSROOM STUDY.

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **18th January 2007 to 20th July 2007**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December 2006).
7. Should you wish to extend the period of your survey, please contact Dr R. Cornelissen at the contact numbers above quoting the reference number.
8. A photocopy of this letter is submitted to the Principal where the intended research is to be conducted.
9. Your research will be limited to the following schools: ███████████████████████████ ██.
10. A brief summary of the content, findings and recommendations is provided to the Director: Education Research.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:
    The Director: Education Research
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000
We wish you success in your research.

Kind regards.

Signed: Ronald S. Cornelissen
for: **HEAD: EDUCATION**
DATE: 13th July 2006

Navrae
Enquiries **A Crofton**
IMibuzo

Telefoon
Telephone **021 467-2224**
IFoni

Faks
Fax **021 425-7458**
IFeksi

Verwysing
Reference **Khanya**
ISalathiso

Wes-Kaap Onderwysdepartement

Western Cape Education Department

ISebe leMfundo leNtshona Koloni

Dear Mrs Greta Gudmundsdottir

The management of Khanya Project hereby express appreciation for your keen interest in the learners of the Western Cape and particularly Cape Town.

We hereby extend an invitation to you to avail yourself of the resources that you request to assist you in your study. The character schools that you mention will be to your avail as soon as you have confirmation from Dr. Ronald Cornelissen that you may commence your research.

I hereby suggest that the following schools will be best suited for your intentions. Contact details for these schools will be available to you at a convenient time.

SCHOOL	LOCATION	TYPE

It is heartwarming to notice that our website caught your attention and that it led you to write a short paper on this (I quote) revolutionary and very important Khanya project. Is it at all possible to have an official copy of this paper for our records?

We agree that your research will give us some indicators of how the students use ICT. Your research results will be valuable to the Khanya project and we thank you for this in anticipation.

Please be assured of our continued support and cooperation. We look forward to interacting and assisting you.

Kind regards.

Chas Ahrends
Khanya Project District Coordinator
Western Cape Education Department
CAPE TOWN
SOUTH AFRICA
cahrends@pgwc.gov.za
MOBILE: +2783 7044766

.

MELD ASSEBLIEF VERWYSINGSNOMMERS IN ALLE KORRESPONDENSIE / PLEASE QUOTE REFERENCE NUMBERS IN ALL CORRESPONDENCE / NCEDA UBHALE IINOMBOLO ZESALATHISO KUYO YONKE IMBALELWANO

GRAND CENTRAL TOWERS, LAER-PARLEMENTSTRAAT, PRIVAATSAK X9114, KAAPSTAD 8000
GRAND CENTRAL TOWERS, LOWER PARLIAMENT STREET, PRIVATE BAG X9114, CAPE TOWN 8000

131

Dear Parents/Guardians

Greta Gudmundsdottir, a Ph.D. candidate at the University of Oslo, Norway, has been doing a research study during the past weeks at our school. She will examine computer and Internet use among students by observations and a survey. During April, May and June, she will also be inviting students to participate in interviews. The study being conducted at our school will increase understanding of attitudes and learning with computers. Information gathered will be private and findings will be reported anonymously for individuals or based on group data.

Please review the enclosed information. If you do not want your child to participate in the interviews, please return the attached form. If you have questions, please call the school before [date].

Sincerely,

Sign. Principal

_____

You are making a decision not to participate.
Please return this form only if you do not wish your child to participate.
You may withdraw at any time without prejudice should you choose to discontinue participation in the study.

I do not wish my child to complete the study on computer use.

_____   _____
Name of Learner   Grade

_____
Name of Parent or Guardian

Cape Town January 15, 2007

Dear Parents/Guardians
Your child has been invited to participate in a UWC and University of Oslo research about computer, Internet and cell phone access and use in primary schools in the Western Cape. Your child was selected as a possible participant in this study because the [Name of school] is connected to the Khanya project initiative of the Western Cape Education Department.

The purpose of this study is to explore children's access and skills using computers. Age differences will be examined as well as possible influences of home language and the language of instruction. I am interested in describing the computer use at the school and outside the school, i.e., how, when, where, with what software and by whom computers and cell phones are being used.

I will observe students' software and Internet use during computer sessions and ask students to complete a survey in the observation period. Occasional video and audio recordings will be done during the observation period, focusing on the class as a whole and not on individuals. After the observation period students will be asked to participate in a more detailed interview to further clarify prior findings. The interviews will be audio taped, but individuals will not be identified on the tapes.

Absolute confidentiality is guaranteed. Data from the study will never be disclosed. No one will be identified in any written reports or publications. Only the researcher will have access to the records.

 I believe there are benefits for the students who complete this study. It may increase their awareness about computer, Internet and cell phone use. Furthermore, the results of this study will help teachers and administrators to better understand children's use and access to computers, Internet and cell phones and they can subsequently see where they need more support or motivation. Data gathered will in no way influence your child's grades.

Please keep this form. If you agree to participate, do nothing. Your consent will be assumed and your child will complete the study. However, if you do **not** wish your child to complete the study, please complete the form below and return the form to the school before [date]. Alternatively, phone the school at [phone number] and indicate that you do not wish your child to participate.

Kind Regards

Ms. Greta Gudmundsdottir
PhD Candidate, University of Oslo - Norway

Bazali ababekekileyo

UGreta Gudmundsdottir, umfundi wesidanga sezobuGqirha (iPhD) kwiYunivesithi yase-Oslo eNorway, ubesenza uphando kwesi sikolo sethu kwiiveki ezimbalwa ezidlulileyo. Ebeqwalasela ukusetyenziswa kwekhompyutha ne-Intanethi ngabafundi, oko ekwenza ngokubukela nangophando. Ngenyanga ka-Apreli, kaMeyi kunye nekaJuni uzakuba esenza udliwano-ndlebe nabafundi. Olu phando lwenziwa apha esikolweni sethu luza kwandisa indlela esikuqonda nesikubona ngayo ukufunda ngeekhompyutha. Ulwazi oluthe lwaqokelelwa luza kuba yimfihlo, kwaye iziphumo zolu phando ziyakwaziswa ngendlela engankqangazi magama abantu okanye amaqela abantu abathe banika ulwazi. Nceda uphononge olu lwazi lulapha. Ukuba unemibuzo, nceda uqhagamshelane nesikolo phambi komhla wama-[Date].

[Name of principal]
Inqununu

IPHETSHANA LEMPENDULO

Mna Mnu./Nkoskz._____umzali ka_____ IBanga_____

ANDIMVUMELI umntwana wam ukuba athabathe inxaxheba kolu phando lokusetyenziswa kweekhompyutha.
(Unokurhoxa nanini na ngaphandle kokudlelwa indlala ukuba ukhethe ukungaqhubekeki nolu phando).

Intsayino-gama yomzali:_____   Umhla:_____

Cape Town
[date]

Bazali ababekekileyo

Umntwana wakho uceliwe ukuba athabathe inxaxheba kwiprojekthi ephakathi kweYunivesithi yaseNtshona-Koloni neyase-Oslo ephanda ngokusetyenziswa nokufikeleleka kweekhompyutha, i-Intanethi kunye neeselifoni kwizikolo zamaBanga aphantsi aseNtshona-Koloni. Umntwana wakho wonyulwe ukuba athabathe inxaxheba kolu phando kuba isikolo samaBanga aphantsi iThembani siyinxalenye yeProjekthi ekuthiwa yiKhanya ephantsi kweSebe lezeMfundo laseNtshona-Koloni.

Injongo yolu phando kukuphononga ukufikeleleka kobuchule bokusetyenziswa kweekhompyutha ngabantwana. Ukushiyana ngokobudala buza kuphononongwa, kunye neempembelelo ezinokwenziwa lulwimi lwasekhaya kunye nolwimi lokufunda nokufundisa. Ndinomdla wokuchaza ukusetyenziswa kwekhompyutha esikolweni kunye nangaphandle kwesikolo, oko kutsho, kanjani, nini, phi, ngayiphi isoftiwe (software), kunye nokuba zisetyenziswa ngoobani iikhompyutha kunye neeselifoni.

Ndiza kuqwalasela isoftiwe kunye nokusetyenziswa kwe-Intanethi ngabantwana ngethuba lezifundo zekhompyutha, ukuze ndicele abantwana bagcwalise iphepha lophando ngelo thuba Ndenza uphando. Kuza kuthatyathwa neevidiyo kwenziwe noshicilelo olunokumanyelwa ngeli thuba lophando, kujoliswe kwiklasi yonke, hayi kumntwana ngamnye. Emva koko abantwana baza kucelwa ukuba bathabathe inxaxheba kudliwano-ndlebe ukunika ingcaciso enzulu malunga neziphumo zokuqala. Olu dliwano-ndlebe luza kushicilelwa, kodwa umntu ngamnye akazukunkqangazwa ngegama kwiiteyiphu.

Kuyaqinisekiswa ukuba konke oku kuza kugcinwa njengehlebo. Ulwazi oluqokelelwe kolu phando alusayi kuthiwa pahaha. Akukho namnye umntu oyakuthi aziwe nakweyiphi na ingxelo ebhaliweyo okanye epapashiweyo. Ngumphandi yedwa oya kubanakho ukufikelela kwezi ngxelo.

Ndiyakholwa ukuba abafundi baya kuzuza lutho kolu phando. Olu phando lunokwandisa ulwazi lwabo ngokusetyenziswa kwekhompyutha i-Intanethi kunye neselifoni. Kwakhona, iziphumo zolu phando ziza kunceda ootitshala nabaphathi ukuba bakuqonde ngcono ukufikeleleka kweekhompyutha, i-Intanethi kunye neeselifoni ebantwaneni, ukuze babone ukuba bafuna inkxaso nenkuthazo engaphaya. Ulwazi oluqokelelweyo alusakuwachaphazela amanqaku omntwana wakho nangayiphi na indlela.

Ukuba uyavuma, akukho nto kufuneka uyenze. Imvume yakho iza kuthatyathwa, aze umntwana wakho athabathe inxaxheba kuphando. Kanti ukuba **AWUTHANDI** ukuba umntwana wakho athabathe inxaxheba kolu phando, nceda ugcwalise le fomu uyibuyisele esikolweni **phambi komhla wama-[date].**

Kamnandi.

Greta Gudmundsdottir (Nkskz)
Umfundi wesidanga sobuGqirha –PhD, kwiYunivesithi yase-Oslo, Norway)

PART II

Routledge
Taylor & Francis Group

An exploration of the importance of piloting and access as action research

Greta Björk Gudmundsdottir* and Birgit Brock-Utne*

Institute for Educational Research, University of Oslo, Oslo, Norway

In this article we illustrate how the piloting process has influenced two widely different studies within the educational sciences. These studies differ in design but have as a common denominator that they used piloting methods in their preparatory process. They are also similar in the intention of the main researchers of conducting research with a critical edge. In the first case study described, our solidarity lies with the disadvantaged school children of South Africa. In the second case study, our solidarity lies with a group of teachers who through an action research project wanted to question a school policy that they do not feel benefits all school children in the Norwegian lower secondary school. The two cases are presented separately and explore the change in conceptual and methodological emphasis in the research procedure. We emphasize how important the piloting and access processes are in order to learn from them and reduce mistakes in the main research design. We argue that both piloting and gaining access can be seen as a form of action research, in that the intention is to learn and to change future action; that is, the purpose is to find out how to conduct a project more effectively. A reflective piloting phase is likely to increase the validity of the research results and can in itself be viewed as action research. Through the piloting phase, learning that may prove invaluable for the later research process is likely to take place. As piloting can be of great value for research results, it should also be given much greater attention in the research literature in general. While the best case scenarios are overrepresented in the research literature, the learning from and of flaws and imperfections that are discovered in the piloting stages of research is equally important for the research community as well as for the actual participants in the researching process. Yet this is under utilized and often left under-reported.

Keywords: pilot studies; qualitative research methods; action research, validity

Introduction

> Researchers often find themselves in the predicament of studying issues of which they have minimal tacit, intuitive, or experiential understanding. This leads the researcher to make educated guesses based on theories or hunches, with some level of hesitation about the validity of the design. (Kezar 2000, 385)

The focus of this article is on the importance of seeing the piloting methodology and access activities as action research, and we show how conducting a reflective pilot study can have meaningful influence on the focus, design and validity.

*Corresponding authors. Email: g.b.gudmundsdottir@ped.uio.no; birgit.brock-utne@ped.uio.no

Pilot studies can be used in research based on both qualitative and quantitative methods. They are widely used in health-related studies such as medicine and nursing (van Teijlingen and Hundley 2001). They are, however, not broadly discussed in action research or in research based on qualitative methods, nor are they seen as action research. Piloting is an important tool in order to avoid methodological surprises, and authors who use this research approach claim that it strongly increases the reliability and the validity of their research. Doing a pilot study often helps the researcher to focus and adapt the research better to the local situation, notwithstanding that all research can unarguably be improved. The main intention of this article is to give an insight into how the piloting process, seen as action research, can improve and increase the validity of research results, including within action research. If the piloting phase is looked at, its action research nature may become clear since it can be, in itself, an action carried out together with practitioners in the field from which an analysis of the results is made. The next action to be made will be based on the analysis carried out in the piloting phase. We argue that gaining access to research sites is also similarly able to be seen as action research with concomitant implications for the actual research.

Examples of two explorative case studies are discussed.[1] The case studies illustrate the advantages connected to conducting pilot studies prior to the main research. The first case study was recently carried out in South Africa by a researcher entering the field for the first time. The other case study was conducted by the researcher in her own country, Norway, 30 years back in time. Both of the piloting studies had considerable influences on the research approach and focus in the main studies that followed. In the first case, the pilot study was used to improve and reflect on the research project in cooperation with the practitioners. In the second case, the researcher finds that the piloting could have been better used had she planned the research project within the piloting phase as a first step in the action research project that later followed.

Why piloting?

Whereas action researchers are engaged in improving their practises by using research to gain better understanding of their own practises (Ponte 2002), Kemmis points out that much of present action research has not been utilized well enough as educational critique (Carr and Kemmis 1986; Kemmis 2006). In the same line of reasoning, Hynds (2008) puts focus on the dominant discourses that influence school practises and argues that a critical collective analysis is needed to reveal the influence these have, in particular, on disadvantaged students. Likewise, Brock-Utne (1996) notes that validity is an important concept in qualitative educational research in developing countries both for researchers from the countries in question and for researchers coming from the outside, normally from more industrialized countries.

Reflective pilot studies, understood as action research, can directly augment stronger ties with the critical standpoint towards educational research, increase the validity of research results and be the vehicle of better praxis.

Within an unknown setting the researcher can use a pilot study to gain insight in the research field, which can lead to both the necessity of redesigning the research focus, questions and methods (case one) or giving an early hunch as to what later problems in the research process may consist of (case two). A researcher with a different cultural background is able to try out the cultural appropriateness of the general design

of the research in order to improve research protocols and the quality and efficiency of the research (Brock-Utne 1996; Lee, Moore, and Cotiw-An 1999; Tayeb 2001).

Based on research such as that of Cohen, Morrison, and Manion (2007), van Teijjlingen and Hundley (2001), and our own experience, we list the following opportunities that pilot studies offer for conventional and action research (note that this is by no means an exhaustive list):

- Assessing people's willingness to participate/potential or likely response rates.
- Assessing the feasibility of the main study.
- Assessing the proposed data analysis techniques to uncover potential problems.
- Assessing whether the research design is realistic and workable.
- Collecting preliminary data.
- Convincing funding bodies that the main study is feasible and worth funding.
- Convincing funding bodies that the research team is competent and knowledgeable.
- Convincing other stakeholders that the main study is worth supporting.
- Determining what resources (finance, staff) are needed for main study.
- Developing a research question and research plan.
- Developing and testing adequacy of research instruments.
- Establishing whether the sampling frame and techniques are adequate and effective.
- Estimating variability in outcomes to help in determining sample size.
- Gaining feedback on length/timing/coverage/ease of completion (when to conduct the data collection as well as how long each type takes to complete).
- Gaining general feedback on clarity, appropriateness, readability of methods and approaches.
- Generating items for further exploration/discussion.
- Identifying logistical problems that might occur using the proposed methods.
- Identifying sensitive topics and/or problematic/difficult/complex issues.

The scarcity of pilot studies within qualitative and action research

Certainly all of the opportunities above are valid arguments for conducting a pilot study. All of them can influence both the validity and the quality of research. The question remains: Why is the discussion of pilot studies so slim when they promote better quality research? Despite pilot studies being conducted, they are rarely elaborated as a part of the research procedure, and when they are there are no connections made to action research. Reflections on access often occur after the project has finished, and we suggest here that there are significant gains to be made when considering it as action research during the actual process of setting up projects.

Pilot studies are sometimes called feasibility studies, true to their quantitative nature. It is, for example, common within health-related disciplines to use small-scale studies in order to pilot what influences a new treatment or new methods may have on individual subjects (Gardner et al. 2003; Lancaster, Dodd, and Williamson 2004; van Teijjlingen and Hundley 2001). In the humanities, pilot studies are normally used to try out different methods of data collection, observation schemes, questions in certain cultural or social contexts, to clear out misunderstandings in the wording of questionnaires, and so forth (Cohen, Morrison, and Manion 2007). Despite these benefits, pilot studies are marginalized in the publishing arena and within action research. They are

neither widely described nor analysed in discussion on methods or findings in internationally published articles. When Lancaster, Dodd, and Williamson (2004) conducted a study on the use of pilot studies in health research in the year 2000/01, they however found out that journal editors did not have any specific publication policy towards pilot studies other than that each article was considered on its own merit. Pilot studies are often small-scale studies, which may explain why they are not considered as attractive by publishing houses.

In the spirit of participatory action research with emphasis on reflection and revision of plans, piloting research methods and gaining access should be emphasized to a much greater extent in the research process as well as towards the dissemination and/or implementation of findings. We would like to argue that the link between pilot studies, access and action research is particularly strong due to the improvement element underlying their methodologies. However, those involved in action research are most often studying their own practice and know well the context of their work.

The emphasis on action and reconnaissance may partly explain the lack of attention to piloting studies being conducted within action research. Another explanatory factor is that action research is more often than not an ongoing process, not solely connected to a time-limited research project conducted by an external researcher. Despite these 'hindrances' and given that participatory action research is understood in terms of improvement such as Kemmis and McTaggart (2005) describe it, pilot studies need to be included in the scholarly discussion within qualitative educational research and action research just as much as within quantitative research and within research within other disciplines. It is an 'underutilized technique', as argued by Kezar (2000, 385), which is not frequently conducted due to both financial and time constraints.

By discussing two separate and different cases from our own research we will argue that it is helpful to publish the findings from pilot studies as well as the end result of main studies. The pilot cases introduced here both added substantial value to the quality and validity of the main research that followed and taught us valuable lessons for our later research.

Piloting as part of a preparatory visit

The first study was conducted in the Western Cape region in South Africa. It was a preparatory part of a research project on the digital divide in South African classrooms. The main aim of the pilot project was to provide basic information on the use of information and communication technology (ICT), as well as to gain an idea of the integration of computers in public schools. Regardless of the fact that South Africa is a middle-income country, the inequality between different groups in South Africa is among the greatest in the world (Taylor 2000). This inequality does appear in different ways, and can for example be seen in access to and use of ICT.

The piloting phase

Through the LOITASA[2] network and researchers at the Faculty of Education at the University of the Western Cape, two schools were contacted for the purpose of the pilot study in order to gain easy access to relevant participants. They were chosen from certain criteria on the basis of sampling for heterogeneity. Tashakkori and Teddlie (1998, 76) define sampling for heterogeneity as cases that are, 'selected such

that their combination provides the maximum heterogeneity on certain attributes (e.g., ethnicity, education) that are important for the research objectivity of the study'.

The two schools were at different ends of the continuum when it comes to ICT integration and use (United Nations Educational, Scientific and Cultural Organisation 2002). The township school was in a poor disadvantaged area[3] with crowded classrooms, hosting approximately 60 students and one teacher. The school had no access to computers, and when asking the students on computer use in and out-of-school it proved to be a ludicrous task as most of the students had never been exposed to computers.

The majority of the students at the school speak isiXhosa as their home language. Despite this fact, the school is a so-called 'dual-medium' school – which is typical for townships schools in South Africa. A dual-medium school indicates that the students are taught the first three years in their mother tongue and after that there is a switch, most often to English. The realities from the classroom are, however, not in agreement with the official language policy. Teachers commonly use code switching and code mixing methods as coping mechanisms in order to impart the subject matter they are supposed to teach (Brock-Utne and Hólmarsdóttir 2004).

The other pilot school is a historically white school,[4] which refers to a school historically for white students only. The school is located in the middle of a suburban residential area and both the school building and the school yard are well maintained. The average class size is around 30 students and both students and teachers have computer access in a well-equipped computer room at school. Furthermore, specialized educators dedicated to the use of ICT support both students and teachers. The seventh-grade class visited for the pilot study was an English medium class and had 31 students.

Raising the validity

To focus on students in Grade Seven was thoroughly discussed prior to the preparatory visit and supported by local teachers and researchers. Grade Seven students are for the most part around 13 years of age, although they can be considerably older in township schools due to early drop outs or pauses in the studies caused by a range of social problems. The drop-out rate increases immensely after primary education and especially after Grade Nine (Abdi 2001; Fataar 1998; Mabizela et al. 2007). Consequently, choosing older students would not present as varied a sample. Grade Seven students were also considered a suitable age group as their English-language skills should be comprehensive enough for a researcher to conduct interviews with them in English even though it was not their home language. Finally, it was assumed that Grade Seven students could be expected to have some previous experience and knowledge of ICT, and were therefore more suitable for this study than students from lower grades. The sample was thus carefully planned in order to obtain as inclusive and well-functioning a sample as possible.

The intention with the preparatory visit was first and foremost to try out some of the questions that were meant to be used in the full-scale study both in the interviews with students and teachers and in a questionnaire. The purpose was also to check the feasibility of the study by assessing the complexity and relevance of the questions for the local situation in the schools and to 'fine tune' research procedures (Sieber 1992, 11). As Strauss and Corbin (1990) state, former knowledge gained by the researcher's own experience in the field of enquiry will help in understanding events and actions better.

The pilot study included informal interviews with seventh-grade teachers and students. The main data source consisted of a questionnaire containing 20 questions, which students in one seventh-grade class in each of the two schools answered. A total of 91 students answered the questionnaire in the two classes. Before answering the questions the students were specifically asked to leave the questions blank if they did not understand them. This option was commonly utilized by the isiXhosa students but was an exception in the historically white school.

Learning from the piloting phase

The pilot study identified immediate language problems. When starting to answer the questionnaire, it became clear that the students in the township school had great difficulties in understanding the questions. Despite the fact that the students were supposed to have had English as the language of learning and teaching (LoLT) since Grade Four, the language was a great hindrance. This led me to see the need to use an interpreter during future interviews with isiXhosa students. Several students in the township school had such problems with the English language that they could not read the questions at all. Additionally, the questions were also too complicated using a five-point Likert scale. The students preferred simpler options such as 'Agree/Disagree' or 'Yes/No' and were not able to use the nuances in the answers. The other class, a former 'white' school now hosting students of mixed ethnic background but mainly English-speaking and some Afrikaans-speaking, did not experience similar difficulties.

Additionally, there was a clear mismatch between questions and answers in the township school. As an example let us look at the question: 'Do you have a computer at home?' (Question Four). Of the total of 60 students who answered in the township school, 56 answered that they did not have a computer at home. In Question Six, when describing their location when last using a computer/Internet, 35 of them answered however that they were staying at home using the computer, even though all but four had previously answered that they did *not* have a computer at home. Furthermore, the students and teachers in the township school did not have a computer at school. Still, 17 of the students answered that they used a computer at school from two to more than 20 hours a week. The questions that rise are: Did they not understand the questions? Did they answer in a way they wished their computer use to be or were they trying to make a good impression on the foreign researcher? Certainly this was of great concern as the same mismatch was not found in the other school where the students had English as LoLT and the majority of the students had English as the mother tongue as well.

I would like to argue that the above findings are particularly important when a researcher is working in an unfamiliar setting where he/she is new to the cultural context. It underlines the importance of piloting questions and getting acquainted with the field prior to the main study. It also emphasizes some of the limitations of questionnaires regarding both content and wording.

The clear divide

The gap between users and non-users of computers was, as expected, based on the well-established and existing social divides in the society. Whereas the students in the township school came from low socio-economic backgrounds and had restricted access to ICT both at home and in school, the students in the historically white school

had good access to ICT both in school and at home. As all students are supposed to have equal rights to quality education after the apartheid era, the immense gap between equipment and access was nevertheless unpleasant. Some comprehensive studies have been done on the differences between learning environments in township schools and schools in more affluent areas (Chisholm 2004; Pillay, Roberts, and Rule 2006). These studies are focusing on the post-apartheid period and support Soudien (2004) when he states that the poor in the society still experience discrimination despite the fact that the social nature of South African education has changed radically. Other scholars focus on financial models, school fees and private schooling (Fiske and Ladd 2004; Hofmeyr and Lee 2004) or on the issue of language of learning and teaching (Desai 2001; Heugh 2003; Hólmarsdóttir 2005; Plüddemann, Mati, and Mahlahela-Thusi 2000) to explain some of the differences in educational opportunities of South African students.

When it comes to ICT access, the students in the historically white school were clearly in a superior position. The pilot study detected that it could be of greater research interest to focus only on the disadvantaged students in the main study and explore their access and use of ICT. Due to the great disparity between the two schools, it was also decided to put focus on schools that had started implementing ICTs to some extent and were as such providing an action element that could be followed up through research by the practitioners and myself (G.B.G.). Finally, due to the language challenges during the pilot study, the main study should focus on schools using different LoLT. This could clarify the possible role language plays in the adoption of new technology, and the development of ICT competence by the students.

The importance of language

Apart from finding out that the digital divide is greatly linked to the existing social divides in South Africa, the most remarkable finding is the overwhelming influence of language on all aspects of learning in South Africa. Having presumably one of the most progressive language policies in the world and 11 official languages, all with equal status, the language issue is something that touches every South African. A South-African socio-linguist, Makelela (2005) claims that the language policy of South Africa is, however, not as progressive as it may seem, since the nine African languages are the main languages of the old bantustans of the apartheid regime. A more progressive policy might have been to harmonize the written forms of these languages into Sotho and Nguni. This is challenged, however, by those claiming that cultural identities would never coincide with such an approach.[5]

While conducting the pilot study it was surprising to find out how badly the students with non-English home languages spoke English, a language that was supposed to have been their LoLT since Grade Four. When talking informally with the students and asking them questions regarding computer use they had severe difficulties in understanding the questions.

Consequently I started reflecting more on the issue of language in connection with computer use. The questionnaire was simplified as well as translated into all three main languages of the Western Cape (isiXhosa, Afrikaans and English). Additionally, the importance of using interpreters when interviewing the isiXhosa-speaking students became evident. The students could then decide whether they felt comfortable enough to speak English or if they rather wanted to speak their home language during the interviews.

Kemmis argues that:

> The quality of practitioner research is not just a matter of the technical important problems in thought and action, in theory and practice – problems worth addressing in and for our times, in and for our communities, in and for our shared world. It is a matter of addressing important problems for education, for the good of each person and for the good of our societies. (2006, 471)

This is where language certainly plays a role. It is not only important that students can technically understand and answer questions in a study such as the one discussed here. It is also a matter of the whole process of teaching and learning in a familiar language and how capable students are of adopting new skills such as the use of ICT. The greatest benefit of this study was that it showed how important it is to design research in such a way that the focus and methodological approach are addressing real problems and issues in education. In this case it really proved to be the language issue.

Piloting as part of action research

The second case is different in many ways from the first one. This case ended up as an action research project (Brock-Utne 1979, 1980, 1981, 1988) although it was originally not planned as such (Brock-Utne 1988). The important phase in the beginning of the project was not planned as a pilot study either. This is, however, the way it functioned. The further we got into the action research study, the more we drew on information gathered in the first, very tentative phase of the project. In a way, most of the problems we ran into could be foreseen from data gathered in the first phase, had we only taken the time then to analyse them and looked at them as piloting the action research project that later took place.

The reason why we had rich data – so-called thick description – from this first part of the project had to do with the fact that I (BB-U) kept a detailed day-to-day diary, writing down both interviews and incidents in as neutral language as possible on the left side of each page and furnishing them with asides, hunches and interpretations on the right side of each page. The object was to get access to the schools where the observations and the project that later turned into an action research project were taking place (Brock-Utne 1979, 1980).

Before I started on this project I had been asked by teachers in two very different lower secondary schools outside Oslo to help them in their endeavour to change both the teaching and the working environment of the school. The schools were located in the same municipality, had the same material resources, and had students mostly coming from the same middle-income to higher-income brackets and teachers of about the same age and educational background. The schools were, however, still very different in several respects. Andenes (pseudonym) had many more open spaces within the school building than the other. This school had organized itself in team teaching groups and used the open spaces innovatively. Yet there were, at the time some of the teachers asked me to come to their school, conflicts that were difficult to deal with within the staff. The other school, Dalen (pseudonym), was built in a very traditional way with closed classrooms and the teachers were isolated within their own classrooms. Several of them were using innovative teaching methods but there was no sharing of ideas. To initiate a discussion of educational themes in the staffroom while eating was even regarded as a thing not to be done (Brock-Utne 1980). Within this school there were, however, some teachers who wanted help to work with questions

such as: How is an environment created in a school so that the students are encouraged to become critical, active and involved? How can a spirit of involvement and creativity in the environment affect also the weakest students and be of benefit to them? How is it possible for us to cooperate closely in this traditionally built school building with a time table not encouraging team teaching?

Some of the teachers at Dalen approached me and wanted help to carry out some innovative and student-centred teaching in their school. A number of master students at the Institute for Educational Research acted as assistants. In the years 1976–1983 I was involved in educational action research both practically and theoretically. I had four sources of inspiration:

- the Work Research Institute of Oslo;
- my student group at the study alternative called Social Pedagogies – a breakaway alternative from the Institute of Educational Research – together with the classroom teachers we worked with (some of the students were also teachers);
- the Cambridge Action Research network under the leadership of John Elliot and with close cooperation with Prof. Lawrence Stenhouse at the University of East Anglia; and
- the Marburg elementary school project under the leadership of Prof. Wolfgang Klafki (1976).

Most of the writing I did in this period was naturally in Norwegian but one article in English explains some of the theoretical thinking behind the approach we used (Brock-Utne 1988), much inspired by Habermas and the Frankfurt school of thought (for example, Habermas and Luhmann 1971).

Access as a piloting phase

Even though we had teachers in the two schools who had approached us and wanted to work with us and I had funding from the Ministry of Church and Culture, we still needed the permission both of the local school municipality where both of the schools were located and the permission of the school itself to work in the school as researchers. I first wrote a formal letter to the school office in the local municipality, explaining the project to them and asking them for permission as well as advice on how to approach the two schools. I got a letter back granting me the permission but also stating that the permission from the municipal school office was not enough. I would also need permission from the schools themselves. After having received this letter I called the school office of the municipality with the request to speak to one of the leading old-timers from that office. I asked him what would be the best way to approach the schools; this is, according to my diary notes from that time (translated by myself), how the officer answered:

> My answer depends totally on which school you are approaching. When it comes to Andenes school, it is no advantage that we call from this office. On the contrary. They do not like to take orders from anyone, especially not from us. It is much better that you call the headmaster yourself, introduce yourself and the project. I am rather certain that the headmaster will say that he thinks the project seems interesting, is happy you already have contacts with some of the teachers but he cannot promise you that you will be admitted to the school. That will be entirely up to the staff to decide. When it comes to Dalen school, however, it is an advantage that we call the headmaster first.

> He listens to us and has great respect both for us and the Ministry of Church and Culture.

I listened to this advice from someone who knew the schools in his district very well. I first called the headmaster at Andenes and explained the project to him and told him that I had actually been invited to study the school by some of the teachers. He said what I intended to do sounded interesting and could be useful for his school. He would mention it to his staff and then call me back. He called me back two days later and said that the teachers wanted me to come to their school and have a thorough discussion with them about the project, my presence in their school, what I actually would be doing, what my role would be. They also wanted to know who would own the data I would produce together with them, how often I should report to them and what my written products would look like. They had set aside two hours for this discussion with me at their next staff meeting, which would be the following week. I decided to have this discussion with the staff at Andenes before I approached Dalen. The discussion was heated, intense and of the 29 teachers present 25 took the floor. In a chapter in a book I later wrote on the project (Brock-Utne 1980) I have analysed the debate going on. We ended up by making several agreements that limited my freedom as a researcher, but agreements that not only were necessary in order to have access to this school but agreements that probably would make cooperation between researchers and practising teachers easier in most places. They decided that a committee of staff members would determine whether I would be allowed to publish a certain piece with data from their school.

When I approached Dalen school, I met a charming and good-humoured headmaster who welcomed me to his school. He told me that the school office of the municipality had called him about the project and he had informed his staff in a break that I would be coming to their school and maybe working together with some of them on a research project. He said:

> You know, I did what I always do when I think there is something the staff ought to accept. I just hammer on a bell I have in the staff room during a coffee break and inform them about something we have been asked to do. In this case we were not only approached by the school office of the municipality. We were also told that your project is supported by the Ministry of Culture and Education. I have great respect for the decisions of the Ministry and think we who are their representatives in the schools should follow up what they decide as best we can. You are most welcome and may start tomorrow.

Having gone through the rather tough discussion about my role with the staff at Andenes school I must admit that I was first rather relieved but also somewhat surprised at the very different approach I was met with from the headmaster of Dalen.

Learning from the piloting phase

These two experiences both concerned my entry into the schools, where my research later began. They took place *before* these projects began and at first I did not see that they were part of the action research project. I did not at the time think of them as piloting any research methodology either. It was what later happened in the project which made me realize that in a way this entry/access work was indeed a piloting phase that could have been better utilized by me had I thought about this as such. Reflective piloting may be looked at as a kind of action research.

The rather uncomfortable discussion I had had with the staff at Andenes in the beginning of the project made my later work there much more productive than it was at Dalen. Since the staff at Andenes knew that I would not publish anything they had not given their consent to having published, they did not mind me taking notes during meetings or coffee breaks. The different teams sought my help and regarded me as a critical friend.

Most of the problems we encountered at Dalen school had to do with the lack of discussion in the pilot phase of the action research project later to take place. Who would be involved? What would be the role of the researcher and university students coming in? Who would own the data and decide on what could be published? If our aim was just to study the climate of this school, it was right not to intervene when the headmaster saw no reason for a discussion with his staff about the research project to be undertaken. His way of behaving in this case was rather typical for the leadership style he practised. He had many good and progressive ideas but his leadership style was authoritarian. He informed the teachers instead of discussing with them. One had to be rather brave to dare to oppose him in public.

Our aim was, however, not to study his leadership style but to help a group of teachers who wanted to start an action research project. They wanted to work together on a project that would encourage students to become critical, active and involved. The project we helped them carry out was a project which in many ways was successful, but it created a big split in the teaching staff. Some of the colleagues who were not part of the action research project complained that the action research group now only discussed educational problems in all the coffee breaks. They did not relax the way they used to. 'In the breaks we shall recover from educational problems and relax', one of these teachers said. They disliked heavily that my students and I went around noting down things. When we later interviewed some of the teachers – both teachers who had been part of the action research project and teachers who had not been part – we taped the interview, wrote it out and had the teachers read the transcript. If they wanted to correct what they had earlier said and had been taped, they were welcome to do so. One would think this would be a procedure giving the teachers the right to the data. The headmaster, however, insisted on censoring what the teachers had said because, as he put it, he had the overall responsibility for seeing to it that his school was portrayed in a good light. His attitude created a split between him and the teachers who had been interviewed and a split between him and me. The mistakes made in the initial pilot phase followed us all through our work at Dalen.

Conclusions

In the piloting phase at Dalen school in case two, the respect shown the headmaster of the school and his leadership style actually prevented us from showing enough respect to the rest of the teaching staff. It was a mistake made in the piloting phase that had unforeseen and negative effects. The tough discussion taking place in the piloting phase of the project at Andenes school actually ensured a non-exploitative procedure throughout the whole research process.

Feldman states that:

[n]ot only must the change be good for those who are affected by the changes, the knowledge embedded in the nature of the change and why it is good should be presented in

ways that affect the political contexts. There must be reason for other teachers, students, administrators, policy-makers and parents to believe and trust that knowledge. (2007, 31)

Feldman is here touching on a problem within qualitative research that has to do with ecological validity (see Brock-Utne 1996). When the ecological validity is high, there is more likelihood that teachers, students, administrators, policy-makers and students can learn from the experiences described. To reach high ecological validity, however, it is important to give a good description of the school where the research was originally carried out. The more accurate the description, the higher the ecological validity but the lower the anonymity. This became a problem at Dalen school where the headmaster insisted that not only the name of his school, of the teachers and the municipality where the school is located be changed, but also the number of students and teachers as well as their age and sex. Should we have followed all the wishes from this headmaster, the ecological validity would have been very low indeed and our report would have had less to do with research and more with fiction.

Looking at computer use in South Africa and comparing classes from different ends of the continuum confirmed what has been recognized by other scholars studying the digital divide; that it is strongly connected to existing social divides. What the pilot study additionally showed was the importance of the context of language and the disparities caused by language. The divergence between questions and answers in the township school was alarming and can partly be explained by poor language proficiency in English.

While explaining the piloting processes of two different studies we argue that the contextual framework of the field is of great relevance for the research process and findings. It directly influences the quality and validity of the outcome of research. In South Africa the influence of language proved to be a central theme within the piloting process and understanding the use of ICT. In the case study reported from Norway, the initial discussion and lack of such a discussion before entering an action research project proved to be decisive for the further development of the action research project itself. We suggest that thinking of piloting, gaining access and entry as action research may be extremely useful at the start of action research projects.

The reason why piloting has so far not been very popular within action research may be that it is a technique frequently used in a situation where a researcher comes into the research field from the outside. In participatory action research, the project is ideally planned by researcher and practitioners together. This does not, however, preclude that the project can start with and indeed benefit from a pilot phase – explicitly understood and conducted as action research – planned by researchers and practitioners together.

Notes

1. While we the authors have cooperated closely on this article, the South African case study is put into writing by Gudmundsdottir and the case study from Norway by Brock-Utne.
2. LOITASA stands for Language of Instruction in Tanzania and South Africa and is a research project conducted by researchers from the University of Oslo, Norway, the University of Dar es Salaam, Tanzania and the University of Western Cape, South Africa. The first phase of the project ran from 2001 through 2006 and produced four books from four workshops (http://www.loitasa.org/publications.html). The project is now into its second phase (2007–2011).
3. It is misleading to talk about previously or historically disadvantaged areas as the students are in a far worse economic and social situation than the students in the historically white schools.

4. The historically white schools had a financial model based on being partly state financed and partly funded by school fees. For a detailed discussion see, for example, Fiske and Ladd (2004).
5. Prof. Zubeida Desai and Dr Vuyokazi Nomlomo, personal communication, May 4, 2009.

References

Abdi, A. 2001. Integrated education and black development in post-apartheid South Africa: Critical analysis. *Compare* 31, no. 2: 229–44.

Brock-Utne, B., ed. 1979. *Fra ord til handling. Pedagogisk aksjonsforskning i utdanningssamfunnet* [From words to deeds. Educational action research]. Oslo: Universitetsforlaget.

Brock-Utne, B. 1980. What is educational action research? *Cambridge Classroom Action Research Network Bulletin* 4, October: 10–15.

Brock-Utne, B. 1981. *Ungdomsskoler i utvikling* [*Innovative schools*]. Oslo: Universitetsforlaget.

Brock-Utne, B. 1988. What is educational action research? In *The Action research reader,* ed. S. Kemmis and R. McTaggart, 253–9. Deakin, Australia: Deakin University Press.

Brock-Utne, B. 1996. Reliability and validity in qualitative research within education in Africa. *International Review of Education* 42, no. 6: 605–21.

Brock-Utne, B., and H. Hólmarsdóttir. 2004. Language policies and practices in Tanzania and South Africa: Problems and challenges. *International Journal of Educational Development* 24, no. 1: 67–83.

Carr, W., and S. Kemmis. 1986. *Becoming critical: Education, knowledge, and action research.* London: Falmer Press.

Chisholm, L., ed. 2004. *Changing class. Education and social change in post-apartheid South Africa.* Cape Town: Human Sciences Research Council Press.

Cohen, L., K. Morrison, and L. Manion. 2007. *Research methods in education.* 6th ed. London: Routledge.

Desai, Z. 2001. Multilingualism in South Africa with particular reference to the role of African languages. *International Review of Education* 47, nos 3–4: 323–39.

Fataar, A. 1998. *Access to schooling in a post-apartheid South Africa. Linking concepts to context in education after apartheid.* Rondebosch: UCT Press.

Feldman, A. 2007. Validity and quality in action research. *Educational Action Research* 15, no. 1: 21–32.

Fiske, E.B., and H.F. Ladd. 2004. *Elusive equity. Education reform in post-apartheid South Africa.* Washington, DC: Brookings Institution Press.

Gardner, G., A. Gardner, L. Maclellan, and S. Osborne. 2003. Reconceptualising the objectives of a pilot study for clinical research. *International Journal of Nursing Studies* 40, no. 7: 719–24.

Habermas, J., and N. Luhmann. 1971. *Theorie der gesellschaft oder sozialtechnologie?* [Theory of the society or social technology?]. Frankfurt am Main: SuhrkampVerlag.

Heugh, K. 2003. Language policy and democracy in South Africa: The prospects of equality within rights-based policy and planning. PhD diss., Centre for Research on Bilingualism, Stockholm University.

Hofmeyr, J., and S. Lee. 2004. The new face of private schooling. In *Changing class. Education and social change in post-apartheid South Africa,* ed. L. Chisholm, 143–74. Cape Town: HSRC Press.

Hólmarsdóttir, H. 2005. Literacy in two languages? Implementing the language in education policy (LIEP) in South African primary schools. PhD diss., Faculty of Education, University of Oslo.

Hynds, A. 2008. Developing and sustaining open communication in action research initiatives: A response to Kemmis (2006). *Educational Action Research* 16, no. 2: 149–62.

Kemmis, S. 2006. Participatory action research and the public sphere. *Educational Action Research* 14, no. 4: 459–76.

Kemmis, S., and R. McTaggart. 2005. Participatory action research. In *The Sage handbook of qualitative research,* ed. N.K. Denzin and Y.S. Lincoln, 559–603. Thousand Oaks, CA: Sage.

Kezar, A. 2000. The importance of pilot studies: Beginning the hermeneutic circle. *Research in Higher Education* 41, no. 3: 385–400.

Klafki, W. 1976. *Aspekte kritisch-konstruktiver erziehungswissenschaft* [Aspects of a critical-constructive educational science]. Weinheim und Basel: Beltz Verlag.

Lancaster, G.A., S. Dodd, and P.R. Williamson. 2004. Design and analysis of pilot studies: Recommendations for good practice. *Journal of Evaluation in Clinical Practice* 10, no. 2: 307–12.

Lee, J.-A.L.M., S.J. More, and B.S. Cotiw-An. 1999. Problems translating a questionnaire in a cross-cultural setting. *Preventive Veterinary Medicine* 41, nos 2–3: 187–94.

Mabizela, S., C. Simkins, S. Howie, P.S.V.D. Berg, J. Arrow, F. Patel, and G. Nyanda. 2007. Progress report to the Minister of Education Mrs. GNM Pandor. Ministerial committee on learner retention in the South African schooling system. http://www.create-rpc.org/pdf_documents/Ministerial_Report.pdf.

Makalela, L. 2005. 'We speak eleven tongues'. Reconstructing multilingualism in South Africa. In *Languages of instruction for African emancipation: Focus on postcolonial contexts and considerations,* ed. B. Brock-Utne and R.K. Hopson, 147–75. Dar-es-Salaam: Mkuki na Nyota Publishers; Cape Town: CASAS; Oxford: African Books Collective; and East Lansing, MI: Michigan State University Press.

Pillay, U., B. Roberts, and S. Rule, eds. 2006. *South African social attitudes. Changing times, diverse voices.* Cape Town: Human Sciences Research Council.

Plüddemann, P., X. Mati, and B. Mahlahela-Thusi. 2000. *Problems and possibilities in multilingual classrooms in the Western Cape.* Occasional papers no. 2. Cape Town: PRAESA.

Ponte, P. 2002. How teachers become action researchers and how teacher educators become their facilitators. *Educational Action Research* 10, no. 3: 399–423.

Sieber, J.E. 1992. *Planning ethically responsible research. A guide for students and internal review boards.* Newbury Park, CA: Sage.

Soudien, C. 2004. 'Constituting the class': An analysis of the process of 'Integration'. In South African schools. In *Changing class: Education and social change in post-apartheid South Africa,* ed. L. Chisholm, 89–114. Cape Town: HSRC Press.

Strauss, A.C., and J. Corbin. 1990. *Basics of qualitative research: Grounded theory procedures and techniques.* London: Sage.

Tashakkori, A., and C. Teddlie. 1998. *Mixed methodology: Combining qualitative and quantitative approaches.* Applied social research methods series. Thousand Oaks, CA: Sage.

Tayeb, M. 2001. Conducting research across cultures: Overcoming drawbacks and obstacles. *International Journal of Cross Cultural Management* 1, no. 1: 91–108.

Taylor, V. 2000. *South Africa: Transformation for human development 2000.* Pretoria: UNDP. http://www.undp.org.za/sahdr2000/sahdr20002.html.

United Nations Educational, Scientific and Cultural Organisation. 2002. *Information and communication technology in education. A curriculum for schools and programme of teacher development.* Paris: UNESCO.

van Teijlingen, E.R., and V. Hundley. 2001. The importance of pilot studies. *Social Research Update* 35, Winter: 1–4. http://sru.soc.surrey.ac.uk/SRU35.html.

II

GRÉTA BJÖRK GUÐMUNDSDÓTTIR AND SÓLVEIG
JAKOBSDÓTTIR

11. A DIGITAL DIVIDE

Challenges and opportunities for learners and schools on each side

INTRODUCTION

One of the educational challenges we are facing today is the uneven access to and skills in information and communication technology (ICT). Despite a policy emphasis in most countries of the world on the development of computer competence, differences in computer skills and proficiency are apparent. The centrality of information technology in so many aspects of our lives is thus linked to the marginality for those without it (Castells, 2003). There are huge differences between and within continents, countries and areas, as well as different societal groups. Van Binsbergen (2004) asks, for example, whether ICT can belong to Africa at all or if it belongs to the North Atlantic region. These differences have often been characterized by the term digital divide. There have been many interventions and ideas on how to bridge it. However, the whole discourse around the digital divide and ICT has been criticized for being predominantly Western based and strongly connected to power structures in the world (Gudmundsdóttir, 2009; van Grasdorff, 2004; Wasserman, 2003). Kanwar (2007) has also criticized the use of the metaphor of bridging the digital divide because bridges will not eliminate chasms but only provide temporary solutions. She asks instead how we can convert a digital divide into a "digital dividend" and urges us to look at successes and failures on both side of the divide. She recommends increased collaboration between the 'north' and the 'south' in order to complement strengths and to promote quality education for all. With that vision in mind, we look at opportunities and challenges which schools, educators and learners face when using computers and the Internet on the 'north' and the 'south' of the divide. In this chapter, we present results of a study conducted in 2007 on computer use among seventh graders in four South African schools and compare the findings with an ongoing study in Icelandic schools, which shows how learners' computer use has developed from 1998 to 2008.[1] Our aim is to explore computer skills and attitudes of young people in South Africa and in Iceland in order to point out some of the common challenges and educational opportunities these nations face. We focus on the similarities as well as the differences in computer implementation, thus hopefully contributing greater understanding of the meaning of ICT within education in different cultural contexts.

BACKGROUND

ICT and national policy

Iceland and South Africa are far apart geographically and the living conditions for the majority population in South Africa are quite different than for the population in Iceland. Iceland is one of the Nordic countries with a strong welfare system. On international indexes of human development Iceland is among the highest and the inequalities in the society and social stratification are minimal.[2] South Africa however is known for being highly stratified, struggling with the legacy of apartheid and oppression for decades. Despite the abolishment of apartheid in 1994 followed by the new Constitution from 1996 (South African Government, 1996), the living conditions of different population groups are far from being equal.

Similar to what is happening in most countries in the world, South Africa's society and economy is changing and reshaping, due to the information revolution taking place. The country shows evidence of the global move towards greater ICT access with digital competence being viewed as a primary development contributor (Tlabela, Roodt, Paterson, & Weir-Smith, 2007). Scholars have pointed out the importance of universal access and digital competence to avoid social exclusion, to strengthen social movements and participation, and to decrease the urban/rural divide (Castells, 2000, 2003; Czerniewicz & Brown, 2005; Jacobs & Herselman, 2005; Mlitwa & Nonyane, 2008; Warschauer, 2004; Wasserman, 2005a, 2005b).

In South Africa the White paper on E-education from 2004 was developed in order to stimulate four main elements: equity, access, capacity building and creating national norms and standards (Department of Education, 2004b). The National Education Information Policy from 2004 is intended to provide a framework to co-ordinate and monitor the education information system (EMIS - National Education Information Management System), in order to provide better access, planning, monitoring and delivery of educational information (Department of Education, 2004a). On the information website of the South African government (South African Government, 2008) several other ICT initiatives are mentioned, such as the Thutong portal[3] providing access to learning materials. Also a framework for teacher education is being adopted in order to increase ICT skills and training of teachers and principals by 2013 (South African Government, 2008).

In Iceland the ICT educational policy Risk with responsibility: Policy for ICT in education, science and culture 2005-2008 the emphasis is on access to the information society, new opportunities and innovative practice, ICT infrastructure, digital content and finally ethics and safety (Ministry of Education Science and Culture, 2005). The national policy Iceland the e-nation includes some educational measures such as increasing the use of ICT by creating digital educational materials, increasing the variety of distance learning studies, supporting IT leaders in schools and providing online examinations (Macdonald, 2008; Prime Minister's Office, 2008). The current curriculum guide for primary and lower secondary schools identifies outcomes for different subjects including ICT (Ministry of Education Science and Culture, 2007). The guide has changed very little since 1999 when it

introduced profound changes which have not been easily adopted by schools (Macdonald, Hjartarson, & Jóhannsdóttir, 2005).

The concern with more digital content, better learning opportunities and increased digital competence is a common challenge that ICT policies of both countries address. The emphasis on digital competence is a global trend. Within the European Union it is defined as follows:

> Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet (European Union, 2006: L394/315).

In South Africa the greatest emphasis is, however, still on universal access to increase equity. As universal out-of-school access is no longer a problem in Iceland, the policy subsequently addresses the issue of responsibility and ethics and safety of users, especially children. Increased digital competence is and will continue to be a common challenge in both countries.

Digital dualism and differences in digital competence

More than thirty years ago the notion of international technological dualism was introduced by Singer (1970) who maintained that technological dualism referred to an unequal development in technology and science between rich and poor countries. Connecting technological dualism to the digital divide James (2003) points out:

> IT [information technology] is in many respects a reflection of the same pattern of international technological dualism that has helped to produce the pronounced gap in incomes between rich and poor countries. From this point of view, the digital divide … is merely another technological gap that emanates from and reflects the highly skewed distribution of global research expenditures between the north and the south (James, 2003: 23).

During the early days of information technology people frequently used the terms information rich and information poor countries or more commonly information haves and information have nots. These are problematic terms as they entail an ethnocentric way of looking at differential access, simply classifying those with limited access as being people, literally speaking, without information.

As the use of computers and the Internet has developed and escalated, the concept digital divide is being used as the term to describe the differences in access and digital competence (Compaine, 2001; Monroe, 2004; Norris, 2001; Warschauer, 2004). The digital divide can be described as a pedagogical emergency (Cartelli, 2008). Many studies have notably pointed out that ICT has not lived up to its expectations, when it comes to equalizing opportunities for learners in the world. Similarly there are also studies showing the downside of too much access (Jakobsdóttir, 2006; Konráðsdóttir, 2007). Another paradoxical problem was noted by Cuban (2001)

when he found schools in the Silicon Valley that were relatively well equipped, but in which computers were just occasionally used in the teaching practices. Similar findings can be seen in Icelandic schools which are well equipped, but in which teachers do not use computers as actively in class as might be expected (Empirica, 2006). Monroe (2004) points out that typically these studies are based on schools in high-income communities, whereas the situation in low-income communities is much more serious. Noteworthy findings from research among university learners in the Western Cape region in South Africa show a marked divide between information literacy skills, according to ethnic and social background (Czerniewicz & Brown, 2006; Sayed, 1998).

The centre of attention is increasingly moving away from material or physical access and more towards the skills needed and the opportunities that one has to possess in order to be able to use the tool. This change is reflected in research in the area of functional literacy, digital literacy or digital/computer competence (Krumsvik, 2008; Saldanha, 2005; Sayed, 1998; Warschauer, 2004). The focus on lack of motivation and the ability to use ICT is increasing. Van Dijk (1999) declares the new divide as the problem of mental and material access versus the skills to apply the technology. Thus, even though we see an increase in basic material access, digital skills, user mentality and cultural appropriateness remain a constraint (Norris, 2001; J. van Dijk, 1999; J. A. G. M. van Dijk & Hacker, 2003). To address the digital divide in the world, UNESCO (2008) has been promoting empowerment of people through information and media literacy as an important prerequisite for fostering equitable access to information and knowledge, and building inclusive knowledge societies.

On Each Side of the Divide

South Africa and Iceland deal with some of the same challenges when it comes to putting an ICT policy into practice within the educational sector. Both countries have, for example, a special language situation. Iceland is one of the smallest language communities in the world with nearly 320,000 inhabitants; South Africa has approximately 48 million people and 11 official languages. A common challenge for both countries is to provide teachers and learners with digital resources in their own languages (Gudmundsdóttir, 2009; Hólmarsdóttir, 2001; Macdonald, 2008).

Internet use is restricted to a relatively small group of the total world's population. According to an estimate from the Internet World Statistics (2009) there are as of March 2009, 1.6 billion people connected [4] to the Internet in the world or roughly 24 per cent of the world's population. Out of these, 48.9 per cent of the European population is connected, while only 5.6 per cent of inhabitants of the African continent have access to the Internet. In Africa 8.5 per cent of those connected are located in South Africa, where there are about 5 million users out of a total of 49 million inhabitants (9.4 per cent of the population). The African continent together with the Middle East has the highest usage growth for 2000-2008 with an average growth of over 1000 per cent.[5] This creates challenges, but also opens up new opportunities.

The Nordic countries have been in the forefront of investing in ICT in education and have by far the highest computer use and Internet diffusion in the world (Pedersen, et al., 2006). In Iceland computers are widely used and Internet access reached 88 per cent of the whole population in 2008 (Statistics Iceland, 2008). The access for households with children under the age of 16 years in Iceland reached 98 per cent with access to computers and 96 per cent with access to the Internet. The lifestyles of young people are increasingly characterized by online activities (Jakobsdóttir, Gautadóttir, & Jóhannesdóttir, 2005). Thus, a challenge in Iceland may be the extent to which educators and parents limit or monitor computer use and Internet access of learners/children as well as the promotion of safe and responsible use of the Internet (SAFT, 2009).

In Iceland, studies have indicated problems related to computer use among children and adolescents, both physical (Jakobsdóttir, 2006) and social/psychological (Jakobsdóttir, 2006; Konráðsdóttir, 2007). South African learners deal with a lack of access, whereas Icelandic learners deal with the consequences of excessive access. Icelandic homes are equipped with computers, not only one but several. In Icelandic schools, ICT skills are seen as an integrated part of most subjects in the curricula, but recent research indicates that computer use by young people in Icelandic schools may not be increasing, in contrast to use at home (Jakobsdóttir, 2006). In South Africa the situation is the opposite. The use at home is often very limited, but, due to policy reforms and emphasis by educational authorities, access to computers is increasing quickly in South African schools, e.g. in Cape Town (Scipio, 2006; Western Cape Education Department, 2008).

The Methodology of Comparison

The early years of comparative education were often characterized by encyclopedic and positivistic approaches of comparison. Later the focus has moved from policy borrowing and lending to emphasis on adapting to cultural context and learning from each other's differences (Arnove & Torres, 2003; Crossley & Watson, 2003; Samoff, 2003; Watson, 2001). The field of comparative and international education is based on diverse and multidisciplinary traditions and does call attention to the strengths of comparison (Bray, Adamson, & Mason, 2007; Crossley & Watson, 2003; Phillips & Schweisfurth, 2006; Steiner-Khamsi, 2004). As Crossley and Watson (2003: 130) point out, it is also "a field that has long recognized the significance of global forces in educational research and development, and one that has consistently examined the dilemmas associated with the transfer of educational policy and practice from one cultural context to another". Similarly Little (2003) argues that, due to globalization, there is a great need for educators in different parts of the world to discuss mutual challenges.

To compare our study cases, we use a framework provided by the school computer culture model developed in the mid 1990s by Jakobsdóttir (1996). Before that time research had indicated a gender-related digital gap (Kay, 1992; Sutton, 1991) in Western societies. The framework was initially developed to examine the use of computers in schools in a contextual manner, providing help to understand

why a gender gap emerged in relation to computers and their uses in some studies but not others. Jakobsdóttir applied Dobbert's (1982) culture definition[6] to define a school computer culture in terms of interrelated parts or factors: i.e., computer implementation[7] (customs/patterned way of life), hardware and software (materials and technology), social context (interrelationship between people and groups), and learners and staff within the culture of different ages and gender with their attitudes and beliefs (beliefs/ideologies/values). The factors Jakobsdóttir referred to as internal were a part of the culture itself and affected learner computer uses and their reactions to computers directly in the schools. In addition, Jakobsdóttir identified external factors that were not a part of a school computer culture, but which nevertheless helped shape and influence it as well as affect the people involved in it. The external factors can be located within the school, school district, community, homes, and the culture as a whole and include home computer access, technology funding and support, and media messages. There are several other more recent frameworks and models exploring the digital divide. Warschauer (2004), for example, uses a division of physical resources, digital resources, human resources and social resources, arguing for the importance of access to all of these resources for a technology that will benefit social inclusion. His framework matches components of the computer culture model quite well.

We will apply the school computer culture framework, which can help us compare our cases. We will identify factors that affect learners' digital competence, related attitudes and challenges.

The research questions which guide the discussion are:
– How do Icelandic and South African learners evaluate their computer skills and what are their attitudes in relation to computer use?
– What are the ICT related challenges and opportunities learners and the educational sector face in the different cultural contexts of Iceland and South Africa.

METHOD

Participants and data

Table 1 gives an overview of the participants in the studies involved and the data collection methods.[8] In the South African study the participating learners were all in grade seven whereas data from the Icelandic study is from grades seven to eight but we have estimated the average age of learners to be similar. In the Icelandic study, the age range varied somewhat by year (see Table 1). However, an estimated average age was 13 for all four groups. The typical South African seventh grader was perhaps a bit younger (12+) but there were several students in the group who were also somewhat older than that. The schools in the South African study all belonged to the greater Cape Town area (both inner city and suburban schools) whereas the Icelandic studies were conducted in schools in the capital area (Reykjavik) as well as in smaller villages or towns in rural areas.

Table 1. Overview of the studies: types of data gathering, number of schools and participants (grades/age range).

Country	Year	Method	No. of Schools	Grades (age range)	No. of learners
South Africa	2007	Interviews, observations, learner survey	4	7 (12+)	290
Iceland	2008	Learner survey, school survey	5	7-8 (11-14)	179
	2004	Learner survey	7	7-8 (12-14)	197
	2002	Learner survey, school survey	11	7-8 (11-14)	493
	1998	Learner survey, school survey	6	7-8 (11-14)	178

In Iceland an online questionnaire was used, with minor changes from 1998 to 2008, to collect data from learners. It included questions on ICT-related skills, attitudes, types of computer, video games, and Internet use in school and out-of-school, home computer ownership and access, peer computer use, and school computer use. From 2002 learners also responded to questions on physical and social problems they associated with computer and Internet use, and more types of computer use were added (including online games and blog). In 2004 the questions regarding problems were improved. Also, a question on the use of mobile phones was added. In 2008 a new question regarding the use of social networks was added as well. In all years, except 2004, a school survey (one for each school) was also completed by one staff member in each school. The questions for staff related to computer and technology access and location, teaching methods, teacher collaboration, development of ICT-related school policy and curriculum, use of computers by teachers and in which subjects.

The questionnaire used in South Africa was similar to the latest version of the Icelandic one but not identical. It was developed as an online questionnaire but due to technical difficulties all of the learners ended up using paper copies. After a pilot study in 2006 to test the relevance of the questions, it was adapted to the cultural setting and simplified both with regard to the wording of the questions as well as the answer options. The Icelandic questionnaire had, for example, a five-point Likert scale in several attitude-related questions. In the South African questionnaire, answer options to those questions were simplified to agree/don't agree, due to confusion and misunderstandings with the five-point Likert scale during the piloting phase. Additionally, the South African questionnaire had several questions on the connection between language and ICT. Questions on problems due to excessive use were not included as such problems were not identified in the pilot study. Comparison of questions on each questionnaire on ICT skills can be found in Table 2. Observations and interviews were also used in the South African study.

Procedure

In Iceland, in all years except 2004, data were gathered in the first half of the school year (November to December). It was done with the help of graduate students in a course on ICT in education[9] who were all practicing teachers.

In 2004, data were gathered by staff members in the participating schools in the second half of the school year (mainly in April to June).

In South Africa the school year starts in January and follows the calendar year. The school year is divided into three or four semesters and the data were gathered during the first and second semester (January to July) in 2007 by Guðmundsdóttir.

<div align="center">RESULTS</div>

In this section we first present findings regarding the ICT skills of learners and computer-related attitudes and motivation as well as problems they report. Following that we will describe the school computer culture, both external and internal factors, which may be affecting learner skills, attitudes and problems. We present results from each country in each subsection, sometimes sequentially but sometimes together or mixed where we have comparable numerical data presented in figures.

Learners: ICT Skills, Attitudes & Motivation, Problems

ICT skills

In both countries, learners indicated on the questionnaire whether they had acquired various ICT related skills (see Table 2).

Table 2. ICT skills assessed by questionnaires in South Africa (2007) and Iceland (1998 to 2008). The nine skills on both lists that are the same or similar are in bold.

Skills – categories (no of skills on both lists)	South Africa	Iceland
Basic skills/file management (0)		install software save files delete files print link to Internet
Information finding and retrieval (1)	**seek information on the Internet** seek information on a CD Rom copy from the Internet copy/download music from the Internet	**find information on the web**
Online communication (2)	**chat** **blog**	**Chat blog** (not in 1998) use e-mail use conferences; social networking (2008)
Creative/presentation (4)	**design web pages** **draw/design** **make presentations** **write text**	**create web pages** **create pictures** **make slides** **write with word processor**
Analytical/programming (2)	**program software** **use data calculations**	**program software** **use spreadsheet to calculate**
Play (0)	play computer games play Internet games	
Total (9)	14 skills	14-17 skills

Figure 1 shows the mean number of skills (only the nine exact or very similar ones were counted) which learners claimed they had in Iceland 2002, 2004 and 2008[10] and in South Africa in 2007. The figures show considerably higher means for the Icelandic learners, both girls and boys. The means were 4.7 to 5.7 skills, whereas the mean for all the schools in South Africa was 3.7. ANOVA for the Icelandic learners (also including learners from grade nine to ten) revealed a difference in the mean number of skills by year ($F(2,859)=23.1$, $p<0.001$). A post hoc test revealed that the mean number of skills for 1998 was lower than for both 2002 and 2004, but there was not a significant difference between 2004 and 2008. Looking at 14 ICT related skills which were on all the Icelandic lists from 1998 to 2004, learners gained on average half a skill per year from 1998 to 2004; girls gained more than boys; and the younger age group (grade seven to eight) more than the older (nine to ten). It is interesting that the above rate of gains in the particular skills assessed did not continue. The 2008 group did not report more skills (in the group of 14) than the 2004 group. It should be noted, however, that a new skill had developed (not asked about on earlier questionnaires). About 70 per cent of the seventh to eight graders in the 2008 group claimed to know how to create a social network. Supporting that claim was that in an open-ended question regarding the learners' last computer use, many learners reported the use of Myspace, Facebook and/or MSN. Gender differences, favoring boys, in the mean number of skills were significant in 2002 (as was the case in 1998). However, in 2004 and 2008 those gender differences were not significant although it is interesting to note that boys reported slightly more skills in 2004 whereas the opposite was true in 2008. Girls appeared to be slowly gaining on and even overtaking boys from 2002 to 2008 regarding the nine skills involved. Perhaps because of their interest and increased experience with different types of online communications.

Figure 1. Mean number of skills reported by learners in Iceland (IS), grade seven to eight; and South Africa (SA), grade seven.

What is most striking from the South African study is the difference between the schools in the study (Figure 2).

Learners in two of the four South African schools indicated similar number of skills as did the Icelandic learners in 2008 but in two schools much lower numbers were reported. There was a significant difference between the South African schools and the number of skills, $F(3,280) = 42.8$, $p < 0.001$. The means were from 2.2 to 5.2 skills regarding the nine skills involved in the comparison but from 3.1 to 9.1 ($F(3,280) = 63.34$, $p < 0.001$) if all 14 skills in the South African questionnaire were included. On the other hand, the range between the five participating Icelandic schools in 2008 was much smaller, only 5.0 to 6.3 skills, a difference which was not significant.
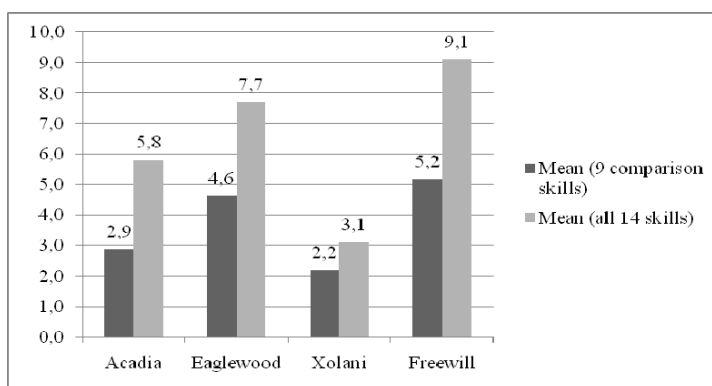

Figure 2. Mean number of skills reported by learners in the four participating South African schools.

Figure 3 shows the percentage of participants who claimed having individual skills (the nine skills on all questionnaires). The 5-6 skills the Icelandic learners most commonly reported having in 2008 were to find information on the web (90 per cent), chat online (81 per cent), create a web site (73 per cent), create slides (65 per cent), create pictures/graphics and blog (62 per cent), and calculate with spreadsheet (59 per cent).

In Figure 3 it can be seen that Internet-related skills for Icelandic learners increased over time (correlations were statistically significant) whereas the number of learners claiming to know how to word process and create graphics decreased over time (also significant correlation). On the other hand, the learners in South Africa most commonly stated that they knew how to write with word processing (71 per cent). The other most commonly reported skills by the South African learners is creating pictures/graphics (54 per cent) and finding information on the web (51 per cent). Programming and blogging were, however, the skills the fewest of them indicated that they had (20 and 21 per cent respectively).
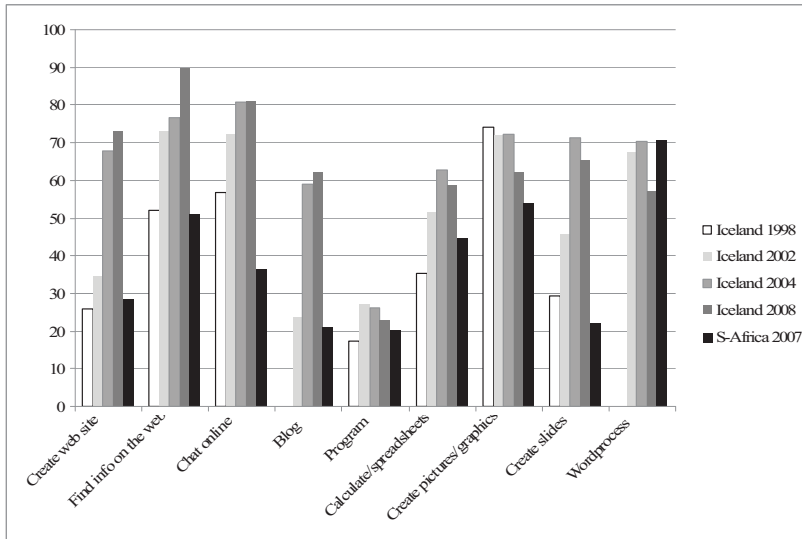
Figure 3. Individual skills by country and year. Percentage of learner group who report they have each skill.

In summary, the Icelandic learners tended to indicate that they were capable of using the computer and the Internet in more varied ways than the South African learners. The number of skills Icelandic learners claimed to have increased between 1998 and 2004 but not between 2004 and 2008. This may, however, be explained by high participation in online communities with the use of Facebook and Myspace. In South Africa learner skills varied a lot from school to school, which was related to the different languages and population groups in each school. Whereas the most common skills in South Africa were categorized in the creative/presentation and information retrieval category the skills most common among Icelandic learners were spread across the main categories (seeTable 2).

Attitudes and motivation (assessed by questionnaires and observations)
Attitudes and motivation regarding computers and their use was assessed by several survey questions in both countries. There were seven questions that were the same on both lists. Figure 4 shows how learners answered those questions. For the Icelandic learners, the neutral answer has been added to each column (white part).

It appears that the South African learners were more positive in their attitude in many of the questions than were the Icelandic learners; although it is hard to compare because the South Africans did not have an option to give a neutral answer (on a five-point scale) as did the Icelanders. However, statistical analysis (ANOVA) revealed a significant difference by year in the attitudes of the Icelandic learners in all questions. Learners tended to become less positive by year, perhaps

because of a decreasing novelty effect in relation to computer use and more exposure to negative effects. Learners in 1998 were more likely than learners in most or all the other years to indicate that computers were important for their future, that computers were necessary tools in study and work, and that it was exciting to use computers. Learners in 2008 were less likely to do so than learners in the other years. In addition, the 2008 group was less likely to agree it was fun to try new things on the computer; and they were more likely than other groups to agree that too much computer use could have bad physical or social effects. However, the 2008 group indicated more confidence than learners in the other years by being more likely to agree that they were good at using computers in many different ways.
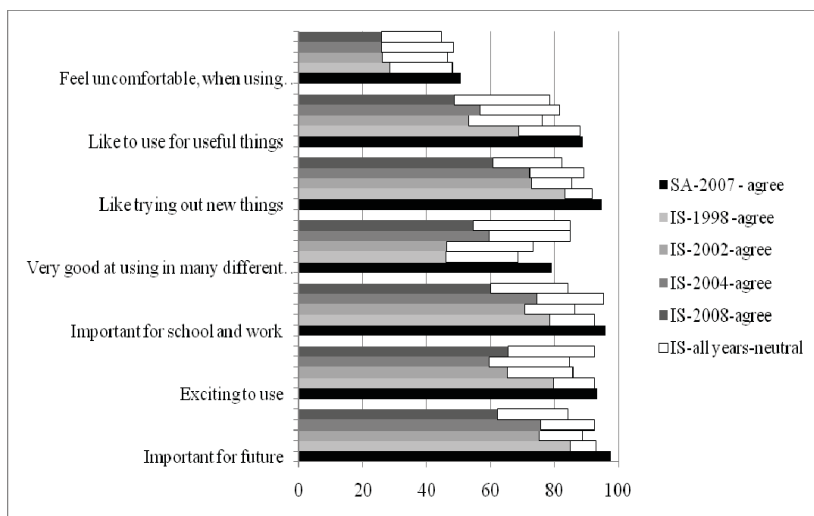

Figure 4. Percentage of learners agreeing (or being neutral) to attitude statements. (IS=Iceland, SA=South Africa).

Learners in the Icelandic study were not observed during computer use at home or school, but their description of the school computer use in open-ended questions tended not to reflect much enthusiasm regarding school use. The learners sometimes expressed negative attitudes. On the other hand, observations of school computer use in the South African schools supported the findings from the questionnaire regarding the high motivation and positive attitude of the learners. As in Iceland this can perhaps be explained by novelty effect and the fact that many of the learners had very limited access to computers outside of school, which made school use more exciting. One might also assume that in a situation, such as in South Africa, where access to computers is highly unequal, the use and implementation of ICT within the school system is of even greater importance than in cultures, such as Iceland, where access

outside of schools as well as within schools is not an obstacle but rather has been throroughly integrated into the overall socio-cultural context.

During the observations in the South African schools, the reactions of the learners were similar to the questionnaire results. The learners were highly motivated and enthusiastic, when given the opportunity to use computers at school. The teachers in the schools were at times insecure about the content of the software or how the system operated. This meant that many teachers solely used the main software provided by Khanya[11] called CAMI. Both learners and teachers have been using this particular software since computers were implemented in the school and it was considered convenient and uncomplicated.

Learner behavior during school computer use in South Africa reflected enthusiasm, attention, and concentration. The most noticeable behavior appeared to be how involved they were in the computer room and how enthusiastically they interacted with the computer, even if no teacher was with them or monitoring them. This was somewhat surprising in the schools where the computer skills were low and the learners were working with similar drill and practice assignments week after week. During interviews with the learners, they all stated how interested they were in learning how to use computers and how important computers were for their future study and/or work. They showed genuine interest in learning more. This interest should be viewed as a great opportunity for educators and policy makers to follow up. When the teachers were asked whether they used the learner motivation to experiment or try out new things on the computers with the learners, many of them answered, unfortunately, that they either did not have the capacity or the time to follow up on their students' interest.

Another interesting behavior of the South African learners indicating high involvement with the computer was animism or verbal behavior addressing the computer/computer screen. When more than one learner was working in front of one computer (sharing), the computer could be included in the group as a participating member of the group. It was also quite common that the learners talked out loud, discussed, counted, conferred and argued "with" the computer, especially when they got an immediate response in CAMI math that they had given wrong answers. This kind of behavior has been reported by other researchers where computers have recently been adopted (Smith & Pohland, 1991). Additionally this can also be an indicator of how learners feel about the computer and themselves and how they integrate the computer in their learning experience.

To summarize the South African learners were more positive and motivated regarding school computer uses than the Icelandic learners which can at least partly be explained by the novelty effect. According to the survey in South Africa, the learners were highly motivated and interested in computers. This was common for all the four schools, despite the somewhat monotonic use of ICT in the least resourced schools. During the observations, this finding was confirmed. The Icelandic learners have started to mention the downside of too much use and are aware that too much computer use can have negative health and social effects. Also, heavy exposure at home to entertaining activities, game playing and interacting socially online with friends may cause some learners to view school computer use as less interesting.

Problems (physical and social)

The Icelandic learners in 2002, 2004 and 2008 were asked to indicate on the questionnaire whether they associated different types of problems with computer use. Learners reported both physical problems and social problems in relation to computer use. There appeared to be more learners complaining of physical rather than social problems (see Figure 5). Headache, eye problems and shoulder and neck pain were most commonly reported in the former case but problems related to potential Internet and/or game addiction in the latter. Statistical analysis (ANOVA) revealed gender differences. Girls tended to complain more than boys of all physical problems except pains in elbows/arms; and also of sexual harassment. Boys complained more than girls did of online fraud and potential game addiction (spending too much time on game playing). However, complaints of a physical nature appeared to decrease significantly by year, except regarding back pain and shoulder/neck pains. It was also interesting that in an open-ended question where learners could report the main problems they associated with computers, many learners reported social problems (e.g. that they or those they knew were spending too much time on the Internet and/or playing games). Perhaps the physical problems were thought to be more manageable so they were not mentioned as the main problem.
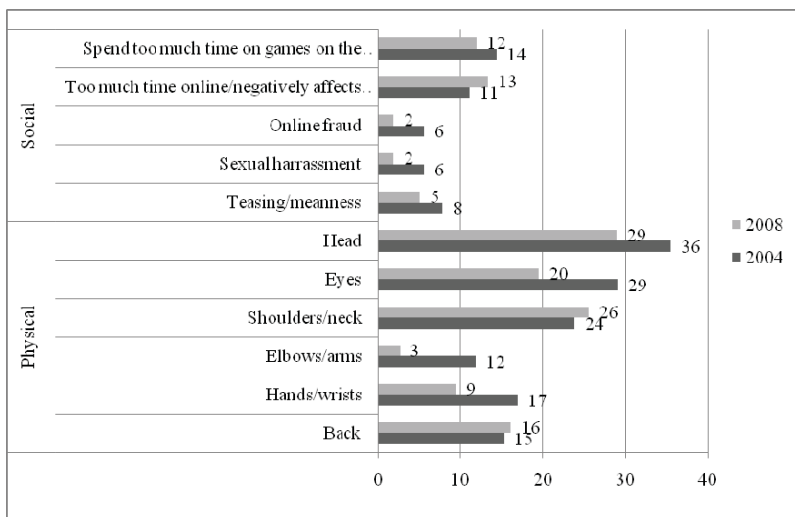

Figure 5. Percentage of learners in Iceland in grade seven to eight reporting problems related to computer use of physical or social nature in 2004 and 2008 to be medium, large or very large (answer rates are 90 to 93 per cent).

School staff was also asked about problems related to computer or Internet use. There were replies from four of the five schools. In one school there were reported to be no big problems; the main problem being that students sought to use MSN and web-surfing when they were expected to be working on the computer. Similar problems had appeared in another school. A staff member there reported that students liked to play games on the web, go to Facebook or YouTube when they were expected to use the computers in relation to their studies. In addition, there had been a problem with use of the hardware/computers in a disorderly manner. The school had reacted by setting up simple, but clear rules regarding computer use and to sometimes allow free time for favorite activities. In bad cases, the school had to close or limit school computer access for individual students. In that school there was an interest in software to control Internet use.

The third school reported problems regarding online bullying with videos or pictures being published online or sent between students via mobile phones. There were incidents in that school of very angry parents, complaining that telephones had been taken from children because of irresponsible use and/or disturbing teaching. Negative effects from MSN use were reported to sometimes spread and affect other activities in the school and students' interaction with each other.

In the South African study questions on physical or social problems, due to excessive use, were not included as they were not considered relevant. The problems in the South African schools were rather connected to limited use, resulting in minor frustration between the learners and commotion in the classroom.

School Computer Culture - External Factors

Society, culture

In the background section of this chapter we have already provided some relevant information and comparisons between South Africa and Iceland in relation to the countries' cultures and national ICT policies and curriculum. All of these can affect how computers are used in the schools and how learners' ICT skills and attitudes develop. We are aware, however, that there may be a gap between policy and practice (Macdonald, 2008; Macdonald, et al., 2005). In this section we provide additional information that is especially relevant in the South African context.

The South African schools in the study are in the Western Cape, one of nine regions in the country. It is the Western Cape Educational Department (WCED) which is in charge of educational matters, such as curriculum development, educational planning, strategies, evaluation and policy implementation. The Khanya initiative under the WCED provides a business plan, with the rationale for ICT implementation in public schools in the region (van Wyk, 2002). Khanya's plan is to implement computers in all public schools by 2012 and give all learners and teachers access to ICT. In the business plan it is stated that implementing ICT in all public schools will address the shortage of teaching capacity by assisting teachers to increase their teaching capacity. Furthermore, it is seen as a significant factor to coordinate efforts towards educating a qualified workforce for the future. ICT is also seen as an important factor in bridging the digital divide and preparing the

region to participate actively in the knowledge economy of the 21st century (van Wyk, 2002). On the Khanya website, it is stated that "all indications are that this target will be reached. Starting with the poorest of the poor schools, Khanya aggressively works towards eradicating the digital divide and striving towards racial and gender equity" (Khanya, 2009: online).

Many external factors do, however, affect computer implementation in schools in negative ways. One hindrance is the cost of maintaining the system as well as the training of teachers for schools with few resources. The technical support coordinated and provided by Khanya was considered inefficient by some of the headmasters that were interviewed. The region is vast and the technical support team serves many schools, thus resulting in a long processing period. Ultimately, teachers are supposed to run the system themselves, but, for the schools with the fewest resources, staff previously unfamiliar with ICT and a relatively short time since the implementation of ICT took place, the lack of technical support proved to be problematic. Hiring of supervisory or supporting personnel was economically impossible. As a result, teachers with limited skills had to monitor the computer lab themselves.

In the Khanya schools it is typical that they need to bear the cost of partially building the computer room itself (supporting walls and roofs, alarm system, etc.) as well as being responsible for updating the software they get in the "starting basket" from Khanya. Khanya provides the hardware, the software starting basket and initial training of teachers. Some of the schools have experienced theft and damage of the equipment. This obviously affected the computer use, as it could take a long time to reinstall or repair the equipment or to find the necessary funds to do so.

Community, districts, schools
The study conducted in South Africa focused on learners in four schools. Three of them are classified as schools for previously disadvantaged learners. This refers to the black and colored population of South Africa. Additionally one ex Model C school was included in the study, which is historically a white-only school.

The participants were primary school children all in grade seven and the schools were all located in the Western Cape. The three schools with a majority of the learners being black and colored were all connected to the Khanya project, whereas the fourth school, the ex Model C school, did not receive support from the Khanya project as it had already established advanced computer use and had good computer facilities. The seventh graders in these schools together with their class teacher and computer administrators were observed using computers and the Internet. The focus in the project was on the three Khanya schools.

Three of the Icelandic schools were in villages or small towns, but two of the schools were in the capital area in or close to Reykjavík. There is considerable variation in the lifestyle of people in these communities. However, most people belong to the middle class and there appears to be little or no digital divide in terms of computer or Internet access between schools or districts (Empirica, 2006). A change in the Icelandic schools participating in the study was that in the later years of study some schools had an ICT committee. However, there had not been

changes in the number of schools that had prepared an ICT related policy – less than half of the schools had such a policy during all three years, although in all years most or all agreed that there was high interest in increasing computer use in the schools.

Homes

The number of ICT skills the Icelandic learners claimed to have had a significant positive correlation with learners' home computer and web use for all years of data collection, as well as the number of software types learners used at home. Such a connection was much weaker with school use of computers, web and software types. This is not surprising as learners tended to spend much more time using computers at home than at school. Correlation with school computer use did, for example, not reach significance for the learners in grades seven or eight in 2008 whereas the correlation with home computer use was highly significant. In 1998, there was a big gender gap in home computer use, which was reflected in girls indicating less confidence than boys in using computers as well as girls claiming a lower number of ICT skills than boys. In 2008, the gender gap concerning ICT skills and time spent on using computers had dissappeared. However, boys indicated more game playing than girls, while girls indicated more use of communication tools (online chat and social networking, mobile phones).

In the South African study there was also a significant correlation between number of ICT skills learners claimed to have and with computer access at home $(r(285)=-0.395, p<0.001)$. Mean number of skills had a tendency to increase with computer access at home and also with Internet home access $(r(275)=-0.470, p<0.001)$ and frequency of use outside of school $(r(269)=0.377, p<0.001)$. On the other hand, the number of ICT skills was not significantly correlated with frequency of school computer use, which corresponds to the Icelandic study.

Figure 6 shows the access of the learners in Iceland and South Africa to computers and Internet, which is very different, and to mobile phones, which appears similar.[12] It should be noted though that the mobile phone access for the Icelandic students refers to personal mobile phones, which may not be the case for the South African learners.[13] Almost all of the learners in Iceland (97-98 per cent) indicated access to computers and Internet at home, while only about half (51 per cent) of the South African students had computer access and less than one third (31 per cent) had Internet access at home. Furthermore, in 2008, 75 per cent of the seventh to eighth graders in Iceland indicated that there were two or more computers in their home, and 42 per cent of that age group claimed to have a computer of their own. Results from a question about learners' last computer use also showed a big difference in the location of that use. Most of the Icelandic learners had used computers at home, while a far higher percentage of the South African learners had used computers in their school (see Figure 7).
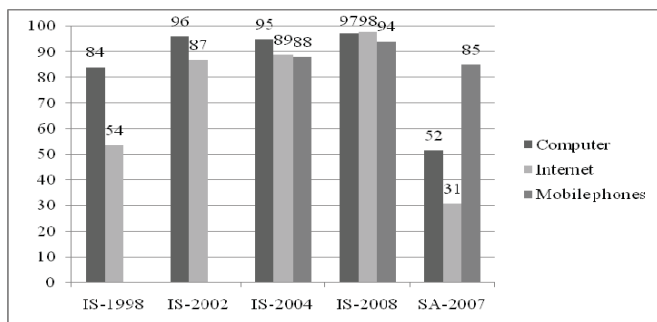
Figure 6. Learners' access at home to computers, Internet and mobile phones.
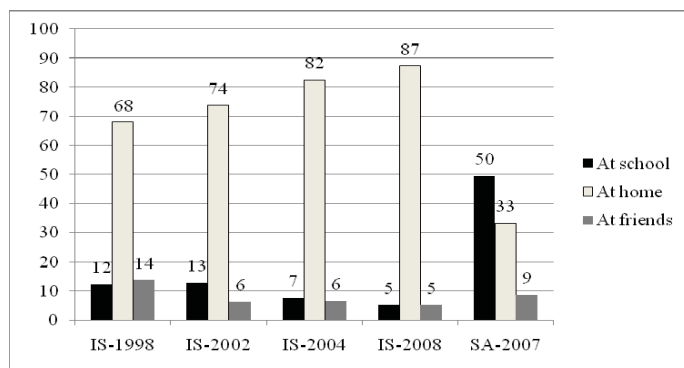*(IS=Iceland, SA=South Africa).*

Figure 7. Location of learners' last use of computers. (IS=Iceland, SA=South Africa).

The home access to computers and Internet is very diverse in South Africa, due to costs and thus highly associated with socio-economic status. Cost and lack of landline access is the greatest hindrance for the poorer disadvantaged groups/ communities in the society. Mobile phones are, however, very popular and used much more often than landlines. There was a significant difference between the South African schools, both for computer access (χ^2 =90.6, p<0.001) and access to the Internet (χ^2 =86.7, p<0.001). Most learners in Freewill primary school, where the majority of learners are white, had home access to both a computer (83 per cent) and the Internet (70 per cent), but the learners in the other three schools had limited access with Xolani (all black learners) reporting the least access (13 per cent and 5 per cent respectively). On the other hand, mobile phone access was similar in all schools (78 to 90 per cent) which indicates how extensive mobile phone use is in South Africa.

School Computer Culture – Internal Factors

Hardware and settings

In the South African schools computer access for the learners was through the computer lab. In the computer lab there were 20-25 computers. The classes differed in size from 30 to 50 learners. Three of the schools were connected through broadband connection, while one of the schools had a dial-up connection. During the fieldwork period technical problems had some negative effects on the computer use. These problems included malfunctioning hardware and software and lack of updating license for some of the educational software. This was especially visible in the school which was located in the middle of one of the townships of Cape Town. It is a "non-fee"[14] school and it has very poor financial resources.

It was obvious that the schools had difficulties maintaining the software and the hardware, due to financial constraints. Some of the computers were not functioning. There were problems with the server or the network, and sometimes the software was not working as it should either due to lack of license renewal or incorrect installation. These problems resulted in less computer use during the observation period, less computer access for the learners and higher learner:computer ratio, which meant more sharing of computers. Sharing a computer, keyboard and mouse often resulted in minor frustrations between the learners as well as commotion in the classroom. Learners had difficulties coordinating their use together and it was often problematic for them to work two and two together or even more in front of one computer screen. This was understandably a greater problem in the schools with big classes. The school which functioned best had a specially assigned computer teacher and a headmaster with a strong vision for ICT. This made it possible for the school to get optimal use of the computer room with maintenance problems being solved within the school without the Khanya technical support desk.

There was a big difference between computer access in the South African schools and the Icelandic schools. Figure 8 shows the access calculated as the number of computers per 100 students in the South African schools and the schools participating in 2008 in the Icelandic study. The means were 17.7 and 4.9 respectively. However, there was considerable variation by school. The school with the highest access (8.1) in South Africa was similar to the school with the lowest access in Iceland (10.0). All the four South African schools had one computer lab for their learners.

Data from the Icelandic schools showed that computer access increased considerably between 1998 and 2002, perhaps due to the national ICT policy and curriculum, which was published at the end of the 1990s. The learner:computer ratio changed in the participating schools from 7.5 in 1998 to 14.9 computers per 100 students in the schools participating in the study 2002. Computer access has not increased much after 2002. In the participating schools 1998, 2002, and 2008, there was at least one computer lab and computers also located in classrooms. Also, some schools had mobile laptop labs in 2002 and 2008. In addition, computers were located in the library in most or all schools all years. Access was also provided for teachers or other staff in the teachers' lounge (or work room).
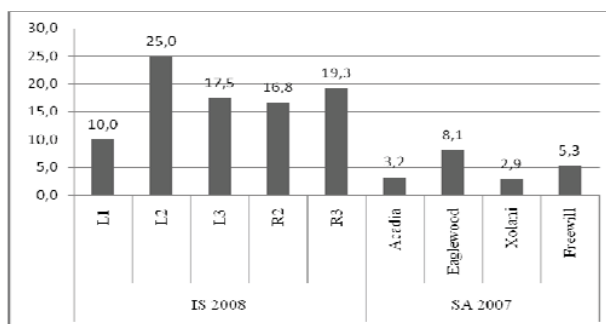
Figure 8. School computer access: Number of computers per 100 students. (IS=Iceland, SA=South Africa).

Some schools had computers available in a room for special needs learners. Internet access increased from 60 per cent of Internet connected computers in 1998 to 100 per cent in the later years. In 2008, the school survey indicated that two of five schools indicated that needs were met, regarding allocation of money towards ICT, but in three schools allocation of funds was considered insufficient.

Digital resources and language

The CAMI maths software[15] was used in all the South African schools for math-related drill and practice. The CAMI reader software[16] was also used and other programs found in the "basket of software" which was a standard package provided by Khanya to all the Khanya schools (van Wyk, 2007). Eaglewood additionally prioritized from its own school budget to buy a license to South African developed educational software called Computers4kids.[17] In Freewill, the non-Khanya school, the learners are taught computer literacy and basic word processing skills together with using computers in consolidating math, spelling, language and sending e-mails. There seems to be strong emphasis on word processing skills as the majority of the South African learners reported to know how to use it.

One of the most challenging issues within the educational system is the language of learning and teaching (LoLT). Learners normally get the first three years of primary school in their home language, but from the fourth grade onwards, it is most often either English or Afrikaans. In this study, questions of LoLT and home language were included and during the observation period it became apparent that learners with isiXhosa as their home language struggled in the classroom situation resulting in code switching and code mixing of the learners (Gudmundsdóttir, 2009). The learners in Freewill and Eaglewood who had English as LoLT from grade one and those having English as their home language as well, did not experience as many hindrances in using computers, the Internet, and searching for information as it was in a familiar language. Very limited software is available in the local languages, especially the African ones. Afrikaans speaking learners in this study

could use CAMI in Afrikaans and as a result they were often much more aware of the importance of having access to software and information in their home language than were the isiXhosa speaking learners who did not have access to any software in their schools and can barely find any information online in their home language.

As noted earlier learners were not observed in the Icelandic study and there was no direct evidence that language was a problem in relation to computer or software use. However, with the small language population, it is a big challenge to provide software and digital learning resources of high quality in Icelandic for the educational market (Hólmarsdóttir, 2001). Each cohort of Icelanders age 6 to 16 has, for example, only 4100 to 4600 children (Statistics Iceland, 2009). Macdonald (2008), in a background report for Iceland in an OECD/CERI project about digital learning resources (DLR), identified the smallness of the country as the biggest weakness in relation to ICT in education and DLR policy. She also pointed out that the Icelandic language was under considerable threat because of the high exposure young people had to English when they were online although it could also provide them with an opportunity to make an international contribution.

Computer implementation and social context

The computer implementation in Khanya schools in South Africa is focused on literacy and numeracy skills to start with. The ultimate goal is to implement the use of computers in all subjects, but now the focus is on these two subjects. Most of the teachers at the three Khanya schools were eager to use the computer lab in the literacy and numeracy classes. However, it was often a simple extension of the lessons that the learners had been through in the classroom, not adding anything new or using the computers in a different way to approach the mathematical problem or the literacy issue as in the classroom. The lessons followed the assignments in the software, and teachers rarely used the computers independently or tried out new things. There was, however, a clear difference between the three schools. In two of the Khanya schools, every now and then the learners were not in the computer room, when they were supposed to be according to their timetable. The reasons the teachers gave was that they had forgotten, that they were on the way or that they did not have anything particular to do that specific day. Typically for all the schools, classes were assigned specific times on a timetable to work within the computer room and learners were dismissed from class to practice their mathematical or literacy skills either individually or in groups of two to three in front of every computer. In the four schools included in this study, time in school for computer use ranged from 30 minutes to two times one hour a week (according to the timetable but not always in practice when it became even less).

In the Icelandic schools, unlike the South African Khanya schools, the overall focus was not on specific subjects (or skills). Schools have had flexibility in how computers have been implemented. In the 2002 study, learners described computer uses in the schools in different ways. For instance, learners in one school emphasized that they learned how to use different kinds of software, in another school the emphasis appeared to be on keyboarding and/or word processing skills,

in the third on computer use in projects, and in the fourth on essay writing. In one school that participated both in 1998 and 2002, computer integration in various subjects appeared to have decreased during the period, but instead concentrated on special ICT classes. All schools in both years 1998 and 2002 had a special subject where ICT was taught and in 2002 and 2008 all schools had mandatory ICT classes (compared to 78 per cent in 1998). However, the schools reported an increasing number of teachers using computers with learners from 1998 to 2008, when about 69 per cent of the teachers in grades seven to eight were reported to use computers with learners (up from 26 to 30 per cent in 1998). The learner surveys, on the other hand, did not indicate an increase in computer use, although there was more web use reported in the years after 1998. In 2008 only approximately 17 per cent of the learners indicated more than two hours per week of computer use at school; although there were significant differences by school. Nevertheless, the learner surveys indicated that number of subjects, in which computers were being used, was slowly on the rise. However, on average learners tended to indicate only one other subject (which varied by school) besides ICT in which computers were used. In 2008, about a quarter of the learners identified social science and a quarter English, 23 per cent Icelandic, 20 per cent mathematics, and 18 per cent Danish. Just over half of the learners reported using computers for home work.

In South Africa, the learners in all the four schools helped each other during the computer classes. Typically, the learners who had good computer skills were often asked to help and walked across the computer room together with the teacher. This type of behavior can give an indication of learners' empathy, attitudes, and learning, because it is largely apparent and easy to observe and record. In the Icelandic schools in 2008, about 64 per cent of the learners had a computer to themselves during computer use. That percentage was higher than in 1998 (40 per cent) but actually lower than in 2002 (70 per cent) and 2004 (82 per cent). These figures perhaps reflect more emphasis on project/collaborative work. In 2008 about 27 per cent of the learners wanted to use the computer all by themselves, 32 per cent with others nearby or together with a friend (37 per cent). Only 4 per cent preferred to use computers in a larger group.

DISCUSSION

Some maintain that the digital divide is diminishing and people will eventually have equal opportunities and become active participants in the global information society. This may be true in some ways, for example, regarding a gender gap in use of computers in Western cultures. However, others argue that globalization processes are further marginalizing the majority of people. The already marginalized will be kept even farther behind, it is argued. They will gain fewer opportunities than before, if no precautions are taken towards universal access and better computer competence for future learners.

In the age of globalization there is a growing trend to find global solutions to global problems. To a certain extent these trends have ignored the local context and cultural relevance, for example, with regard to educational challenges across the world (Crossley & Watson, 2003; Monkman & Stromquist, 2000; Steiner-Khamsi,

2004). However, even though there may be similar challenges found in the educational system of many countries; the culture, capacity and administrative framework is hugely different. In this chapter we have discussed some of the challenges and opportunities we have found through our study of computer use of young people in two countries on each side of the so-called digital divide, Iceland and South Africa.

Applying the school computer culture framework (Jakobsdóttir, 1996), we examined interrelated internal and external factors of these cultures; and investigated which could affect learners' skills, attitudes and reactions to computer use. The learners in Iceland who have been exposed to computers for a longer time than the South African learners show varied skills and are able to use computers in many different ways. A gender divide in computer use that was very prominent in 1998 has disappeared a decade later, in terms of amount of home computer use and number of ICT skills. The main reason is perhaps the development of communication tools that girls have easy access to at home and tend to enjoy using socially with friends. Many boys also use those tools, but the focus for them may be on games, which may limit their involvement with other computer-related activities.

There is a much greater range in ICT skills between the learners in South Africa than between the learners in Iceland which signals a special challenge for South African educators and policy makers. This can partly be explained by varied out-of-school access. Our study supports research that shows a strong correlation between home use (out-of-school use) and computer competence (see for example Facer, 2002; Ito, et al., 2008; Selwyn, 1998).

Being a multicultural and multilingual society, as well as dealing with great differences in the socio economic background of learners, is nothing new for South African educational authorities. In South Africa the rhetoric around ICT is optimistic and it is argued that ICT can have an equalizing effect. In Iceland, which has been a homogeneous population and monolingual nation for centuries, the situation is changing quickly. Increased immigration makes communities and schools far more pluralistic than before, which has already resulted in some increased language challenges and more stratification in society. This is certainly a field where Iceland can learn from South Africa.

It is also of great importance for both countries to stimulate development and use of digital content and educational software in their own languages. This can be done, for example, through supporting the National centre for educational materials in Iceland and the National portal of educational materials Thutong in South Africa as well as regional initiatives such as the Khanya project. The problem is, however, that the Icelandic language community is small and it is very costly to produce local material. The same applies for South Africa with its eleven official languages, if all material is to be produced in all of the languages. The cost is also a challenge when it comes to maintenance, updating hardware and software and buying new software licenses. With an international financial crisis new ways need to be sought that are less costly. The Open Education Resource movement (OERs) promotes collaboration instead of competition and open course content, open source software, and free course development and delivery tools (Kanwar, 2007). In developing countries, including South Africa, there is hope that the use of open resources can

cut costs, increase flexibility and open up for better localization of content (Translate.org.za, 2008). It may be debatable whether the total costs are lower (Northwest Regional Educational Laboratory, 2008), but there may be a question of how money is allocated. Should we pay high license fees to foreign companies or involve local people who can help adapt open content to local needs? There is a small movement in Iceland for the use of open source in education and there is also a recent policy from the office of the Prime Minister about the use of open source in public institutions (Prime Minister's Office, 2007). Reactions to this policy have, however, not been extensive so far.

In some of the South African schools in this study computer use is focused around basic ICT skills whereas in others it reaches the levels of the schools in Iceland. The use varies a lot according to socio-economic background of the learners and is similar to what Hohlfeld et al. (2008) found in the US when comparing different socio-economic status schools and ICT use and skills. The development in Iceland seems to have slowed down in some ways and there is a slight decrease in number of skills that learners in 2008 report compared to learners in 2004. There is a need to increase the competence of educators by offering pre-service training in ICT use in education, as well as continuous in-service training and technical support.

Even if computer access was far better in the Icelandic schools than most of the South African ones, the time each learner gets to use computers in school is a challenge in both countries, and computers are more likely used to support the curriculum rather than to extend or transform it according the CPF framework (Twining, 2002). However, most of the Icelandic learners had easy access to computers in their homes, while the South African learners did not get much time practicing and adding to their skills at home. On the other hand, increasing access alone does not guarantee the ability to make constructive use of the technology.

Our study showed that many of the Icelandic learners complained about physical and social problems they associated with computer use. Some worry that they or their friends spend too much time online affecting study or friendships in a negative way; or that it is difficult to stop playing computer/online games even if they want to. There are also instances of sexual harassment, bullying and social exclusion through online communications. With increased access both countries certainly need to pay attention to ethical and safe use of computers. There may need to be more emphasis on the development of self discipline and monitoring learning.

Through the years South Africans have based their economy on mining and Icelanders on fishing. In both cases it is clear that to get large-scale benefits, large investments are needed, time, planning, coordinated efforts, and processing of what is dug up or caught to produce value. The same is certainly true if schools and learners are to benefit from the information revolution in both countries.

NOTES

2   Social stratification may be increasing in Iceland. There has, for example, been an influx of immigrants in the past decade. People born in different countries than Iceland now comprise ca. 7 per cent of the population, compared to less than 2 per cent in 1998 (Statistics Iceland, 2009). Also, the financial crisis hitting Iceland in October 2008 may result in increased social stratification.

3   www.thutong.org.za is the official educational portal in South Africa and offers varied curriculum materials and support for schools.

4   According to Internet World Statistics an Internet user is a person that has access to an Internet connection point, and a person that has the basic knowledge required to use web technology.

5   It should be noted that the average growth is somewhat high due to the low Internet diffusion before 2000 in Africa. In Somalia for example, which has the highest average growth rate in Sub Saharan Africa at 48,900 per cent, it can be explained with the huge increase in use from 2000 (estimated users in 2000) to 2008 (estimated users 98.000).

6   A culture is a historically developed, patterned way of life which includes beliefs and ideologies; formally and informally established interrelationships between persons and groups; and material goods and technologies, all of which are systematically related so as to form an integral whole (Dobbert, 1982: 10.).

7   Computer implementation could in turn be analysed further in different ways, for example, with the CPF - the computer practice framework (Twining, 2002).

8   In the Icelandic study, more students participated (see an overview in Jakobsdóttir, 2008) than is indicated in the table but for the purpose of the comparison only those from similar age/grade are included.

9   At Iceland University of Education which merged with University of Iceland in 2008 so it is now University of Iceland – School of education.

10   The 1998 data were not included in the comparison because two skills of the nine were not included in the 1998 version of the questionnaire.

11   The Khanya project is a Western Cape Education Department initiative. Its goal is to implement computers in all public schools in the region by 2012. See further http://www.khanya.co.za/

12   In 1998 and 2002 questions of mobile phones were not included.

13   In the South African questionnaire learners were asked whether they had access to a cell phone and not whether they owned a cell phone.

14   Educational authorities divide schools into quintals. Those in the poorest neighbourhoods with learners (parents) of the lowest socio economic layers are non-fee schools.

15   http://www.camiweb.com/index.php?option=com_content&task=view&id=45&Itemid=82

16   http://www.camiweb.com/index.php?option=com_content&task=view&id=41&Itemid=79

17   http://www.computers4kids.co.za/about.htm

REFERENCES

Arnove, R. F., & Torres, C. A. (2003). *Comparative education: The dialectic of the global and the local* (2nd ed.). Lanham, MD: Rowman & Littlefield.

Bray, M., Adamson, B., & Mason, M. (Eds.). (2007). *Comparative education research. Approaches and Methods*. Hong Kong: The University of Hong Kong & Springer.

Cartelli, A. (2008). Digital competence and web technologies: Analysis of a research project and its instruments Proceedings of the informing science & IT education conference (InSITE) 2008 (pp. 271–282). Santa Rosa, CA: Informing Science Institute.

Castells, M. (2000). *The information age. Economy, society and culture* (Vol. 1). Oxford, UK: Blackwell Publishers.

Castells, M. (2003). *The internet galaxy. Reflections on the internet, business, and society*. Oxford, UK: Oxford University Press.

Compaine, B. M. (2001). *The digital divide: Facing a crisis or creating a myth*? Cambridge, MA: The MIT Press.

Crossley, M., & Watson, K. (2003). *Comparative and international research in education: globalisation, context and difference*. London: Routledge.

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

Czerniewicz, L., & Brown, C. (2005). Access to ICT for teaching and learning: From single artefact to interrelated resources. *International Journal of Eudcation and Development using Information and Communication Technology*, *1*(2), 42–56.

Czerniewicz, L., & Brown, C. (2006). *The virtual Möbius strip. Access to and use of Information and Communication Technologies (ICTs) in higher education in the Western Cape* (No. 1. Report series). Cape Town, SA: Centre for Educational Technology.

Department of Education. (2004a). *National education information policy*. Pretoria, SA: DoE (Department of Education).

Department of Education. (2004b). *Whitepaper on e-education. Transforming learning and teaching through information and communication technologies* (ICTs). Retrieved October 10, 2008, from http://www.capegateway.gov.za/eng/publications/white_papers/2004/93586

Dobbert, M. L. (1982). *Ethnographic research: Theory and application for modern schools and societies*. New York: Praeger.

Empirica. (2006). *Use of computers and the Internet in schools in Europe 2006*. Country brief: Iceland. Bonn: European Commision.

European Union. (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. *Official Journal of the European Union*. Retrieved December 30, 2008, from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri= OJ:L:2006:394:0010:0018:EN:PDF

Facer, K. (2002). *What do we mean by the digital divide? Exploring the roles of access, relevance and resource networks*. Paper presented at the A collection of papers from the Toshiba/Becta digital divide seminar. Retrieved February 19, 2002, from http://www.becta.org.uk/page_documents/ research/digidivseminar.pdf

Gudmundsdóttir, G. B. (2009). Language implications of implementing information and communication technology in classrooms in the Western Cape, South Africa. In M. Qorro, Z. Desai, & B. Brock-Utne (Eds.), *LOITASA Reflecting on Phase I and entering Phase II*. Dar es Salaam: E & D Vision Publishing Ltd.

Hohlfeld, T. N., Ritzhaupt, A. D., Barron, A. E., & Kemker, K. (2008). Examining the digital divide in K-12 public schools: Four-year trends for supporting ICT literacy in Florida. *Computers and Education*, *51*, 1648–1663.

Hólmarsdóttir, H. (2001). Icelandic: A lesser-used language in the global community. *International Review of Education*, *47*(3–4), 379–394.

Internet World Statistics. (2009). *World Internet users and population statistics*. Retrieved April 22, 2009, from http://www.internetworldstats.com/stats.htm

Ito, M., Horst, H., Bittanti, M., Boyd, D., Herr-Stephenson, B., Lange, P. G., et al. (2008). *Living and learning with new media: Summary of findings from the digital youth project*. Retrieved December 9, 2008, from http://digitalyouth.ischool.berkeley.edu/files/report/digitalyouth-WhitePaper.pdf

Jacobs, S. J., & Herselman, M. E. (2005). Analysis of the success of ICT at the Ikageng MPCC in support of the Itsoseng community: A case study. *International Journal of Education and Development using ICT*, *1*(3).

Jakobsdóttir, S. (1996). *Elementary school computer culture: Gender and age differences in student reactions to computer use*. Minnesota: University of Minnesota.

Jakobsdóttir, S. (2006). Up on a straight line? ICT-related skill development of Icelandic students. In E. Pearson & P. Bohman (Eds.), *Edmedia - World conference on educational multimedia, hypermedia and telecommunications* (pp. 67–74). Chesapeake, VA: AACE.

Jakobsdóttir, S. (2008). *School computer culture: Ongoing series of studies on computer use of Icelandic children and adolescents, their computer-related attitudes and skills*. Retrieved January 11, 2009, from http://soljak.khi.is/computerculture/

Jakobsdóttir, S., Gautadóttir, H., & Jóhannesdóttir, S. (2005). Life was bacalao - life is Internet. Should we develop a fishing culture mentality in schools? In A. M. Vilas, B. G. Pereira, J. M. González, & J. A. M. González (Eds.), *Recent research developments in learning techologies. III International Conference on Multimedia and ICTs in Education (mICTE2005)*. Caceres, Spain, June 7-10th 2005 (Vol. 3, pp. 1205–1210). Badajoz, Spain: Formatex.

James, J. (2003). *Bridging the global digital divide*. Cheltenham, UK: Edward Elgar.

Kanwar, A. (2007, September 27). *Digital divide or digital dividend? Postcard from the South*. Paper presented at the 12th Cambridge International Conference on Open and Distance Learning Cambridge.

Kay, R. H. (1992). An analysis of methods used to examine gender differences in computer-related behaviors. *Journal of Educational Computing Research*, *8*, 277–290.

Khanya. (2009). *Khanya Reaches 1000'th School Milestone*. Retrieved April 21, 2009, from http://www.khanya.co.za/

Konráðsdóttir, S. H. (2007). *Sofið á verðinum? Tölvunotkun og tíðni netfíknar meðal nemenda í 6.-10.bekk á Íslandi* [Sleeping on Guard? Computer use and frequency of Internet addiction among students in 6 to10. grade in Iceland]. [In Icelandic]. Reykjavik: Unpublished Master's thesis, University of Iceland.

Krumsvik, R. J. (2008). Situated learning and teachers' digital competence. *Education and Information Technologies*, *13*(4), 279–290.

Little, A. (2003). Development studies and comparative education: Context, content, comparison and contributors. In E. R. Beauchamp (Ed.), *Comparative education reader*. New York and London: RoutledgeFalmer.

Macdonald, A. (2008). *OECD/CERI Project: Digital learning resources as systemic innovation. Background report - Iceland*. Reykjavík: Ministry of Education, Science and Culture.

Macdonald, A., Hjartarson, T., & Jóhannsdóttir, T. (2005). "Við vorum ekki bundin á klafa fortíðarinnar": tilurð og gerð aðalnámskrár í upplýsinga- og tæknimennt ["We were not bound by the past": the conception and creation of the national ICT curriculum]. [In Icelandic]. *Uppeldi og menntun*, *14*(2), 71–92.

Ministry of Education Science and Culture. (2005). *Risk with responsibility: Policy for ICT in education, science and culture 2005–2008*. Retrieved April 21, 2009, from http://bella.stjr.is/utgafur/risk.pdf

Ministry of Education Science and Culture. (2007). *Aðalnámskrá grunnskóla í upplýsinga- og tæknimennt* [The national curriculum for compulsory schools in information and technology education]. [In Icelandic]. Retrieved January 12, 2009, from http://bella.mrn.stjr.is/utgafur/adalnamskra_grsk_uppl-taeknimennt.pdf

Mlitwa, N. B. W., & Nonyane, J. N. (2008, July, 7–18). The *status of ICT access and use in South African schools: Comparing the rural and Urban schools in the Mpumalanga province*. Paper presented at the EMERGE 2008, Cape Town.

Monkman, K., & Stromquist, N. P. (2000). *Globalization and education: Integration and contestation across cultures*. Lanham, MD: Rowman & Littlefield.

Monroe, B. (2004). *Race, writing and technology in the classroom*. New York: Teachers College Press.

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the internet worldwide*. Cambridge, UK: Cambridge University Press.

Northwest Regional Educational Laboratory. (2008). *Open options*. Retrieved January 14, 2008, from http://www.netc.org/openoptions/pros_cons/comparing.html

Pedersen, S. G., Malmberg, P., Christensen, A. J., Pedersen, M., Nipper, S., Græm, C. D., et al. (2006). *E-Learning Nordic 2006: Impact of ICT on education*. Retrieved from http://itforpedagoger.skolverket.se/ digitalAssets/177565_English_eLearningNordic2006.pdf

Phillips, D., & Schweisfurth, M. (2006). *Comparative and international education: An introduction to theory, method, and practice*. London: Continuum.

Prime Minister's Office. (2007). *Frjáls og opinn hugbúnaður - Stefna stjórnvalda.* [Free and open access software - Governmental policy] Retrieved 14 January, 2008, from www.forsaetisraduneyti.is/ media/verkefnisstjorn-radstefna-rafraen-framtid/Frjals_og_opinn_hugbunadur_-_Stefna_stjornvalda.pdf

Prime Minister's Office. (2008). *Iceland the e-nation: Icelandic government policy on the information society.* Retrieved from http://eng.forsaetisraduneyti.is/media/utgefidefni/Iceland_the_eNation.pdf

SAFT. (2009). SAFT - Samfélag fjölskylda og tækni (Society, family and technology, project web - Icelandic participant in Safer Internet Action Plan). Retrieved January 13, 2009, from http:// www.saft.is

Saldanha, D. (2005). Literacy-communication and Urbanisation-development. In A. Rogers (Ed.), *Urban literacy: Communication, identity and learning in development context.* Hamburg: UNESCO.

Samoff, J. (2003). Institutionalizing international influence. In R. F. Arnove & C. A. Torres (Eds.), *Comparative education. The dialectic of the global and the local* (pp. 52–91). London: Rowman & Littlefield Publishers.

Sayed, Y. (1998). *The Segregated Information Highway: Information Literacy in Higher Education.* Cape Town: University of Cape Town Press.

Scipio, J. (2006). *The Khanya methodology for ICT implementation in schools.* Retrieved from www.khanya.co.za

Selwyn, N. (1998). The effect of using a home computer on students' educational use of IT. *Computers and Education*, *31*(2), 93–101.

Singer, H. (1970). Dualism revisited: A new approach to the problems of the dual society in developing countries. *Journal of Development Studies*, *7*(1), 60–75.

Smith, L. M., & Pohland, P. A. (1991). Education, technology, and the rural highlands. In R. L. Blomeyer & C. D. Martin (Eds.), *Case studies in computer aided learning* (pp. 13–52). London: The Falmer Press.

South African Government. (1996). *Constitution of the Republic of South Africa.* Retrieved from http://www.info.gov.za/documents/constitution/1996/index.htm

South African Government. (2008). *South African Government Information – Education.* Retrieved January 10, 2008, from http://www.info.gov.za/aboutsa/education.htm#Educationpolicy

Statistics Iceland. (2008). *Information technology in households 2002–2008.* Retrieved January 9, 2008, from http://www.statice.is/

Steiner-Khamsi, G. (Ed.). (2004). *The global politics of educational borrowing and lending.* New York and London: Teachers College, Columbia University.

Sutton, R. E. (1991). Equity and computers in the schools: A decade of research. *Review of Educational Research*, *61*, 475–503.

Tlabela, K., Roodt, J., Paterson, A., & Weir-Smith, G. (2007). *Mapping ICT access in South Africa.* Cape town, SA: HSRC Press.

Translate.org.za. (2008). *Open software translation project.* Retrieved January 14, 2008, from www.translate.org.za

Twining, P. (2002). Conceptualising computer use in education: Introducing the Computer Practice Framework (CPF). *British Educational Research Journal*, *28*(1), 95–110.

UNESCO. (2008). *Information and media literacy.* Retrieved September 30, 2008, from http:// portal.unesco.org/ci/en/ev.php-URL_ID=15886&URL_DO=DO_TOPIC&URL_SECTION=201.html

van Binsbergen, W. (2004). Can ICT belong in Africa, or is ICT owned by the North Atlantic region? In W. van Binsbergen & R. van Dijk (Eds.), *Situating globality. African agency in the apporpriation of global culture.* Leiden: Brill.

van Dijk, J. (1999). *The network society: Social aspects of new media.* Thousand Oaks, CA: SAGE.

van Dijk, J. A. G. M., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The Information Society*, *19*, 315–326.

van Grasdorff, E. (2004). *African renaissance and discourse ownership in the information age.* Hamburg: Lit Verlag.

van Wyk, K. (2002). *Khanya technology in education. Business Plan.* Retrieved November 15, 2008, from http://www.khanya.co.za/projectinfo/?catid=22

van Wyk, K. (2007). A basket of software. Khanya. *Education through technology*, 1–64.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: The MIT Press.

Wasserman, H. (2003). Dial-up identity: South African languages in cyberspace. In H. Wasserman & S. Jacobs (Eds.), *Shifting selves: Postapartheid essays on mass media, culture and identity* (pp. 79–96). Cape Town, SA: Kwela.

Wasserman, H. (2005a). Connecting African activism with global networks: ICTs and South African social movements. *Africa Development*, *30*(1&2), 129–148.

Wasserman, H. (2005b). Renaissance and resistance: Using ICTs for social change in South Africa. *African Studies*, *64*(2), 177–199.

Watson, K. (2001). *Doing comparative education research: Issues and problems*. Oxford, UK: Symposium Books.

Western Cape Education Department. (2008). *Khanya - Summary of the Project*. Retrieved July 12, 2008, from http://www.khanya.co.za/projectinfo/?catid=32

ACKNOWLEDGEMENTS

AFFILIATIONS

Gréta Björk Guðmundsdóttir
Institute for Educational Research
University of Oslo, Norway

Sólveig Jakobsdóttir
School of Education
University of Iceland

III

When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language

G.B. Gudmundsdottir*

Institute for Educational Research, University of Oslo, Sem Sælands vei 7, PO Box 1092 Blindern, Oslo 0317, Norway

The aim of this paper is to highlight some of the challenges of information and communication technology (ICT) integration in a South African classroom setting. The main focus is on the concept of a digital divide, and how cultural complexity with special emphasis on language can affect the divide in schools that already have material access to ICT. The study is based on fieldwork in seventh-grade classes in four primary schools in Cape Town, South Africa. The learners answered a questionnaire regarding their ICT use and skills, and interviews were conducted with learners, teachers, and principals. In conclusion, it is argued that the challenges of language in South African schools can exacerbate or maintain the digital divide among learners who are already disadvantaged due to a range of social inequalities. For learners to fully master the use of ICT in today's global knowledge society, it needs to be put in a local context, which includes use in a familiar language. Moreover, it is suggested that greater opportunities for teacher training are needed in order to enhance culturally sensitive and appropriate ICT integration based on local needs and capacity.

Keywords: digital divide; ICT integration; language of teaching and learning; teacher training; disadvantaged learners

1. Introduction

Information and communication technology (ICT) is a major foundation of the economy in both poor and wealthy nations (Colle & Roman, 2003; Etta & Elder, 2005; Law, Pelgrum, & Plomp, 2008). Consequently, ICT can be seen as the main facilitator of the knowledge society, and ICT can also play an important role in development and in education (Unwin, 2009). Both of the United Nations' targets of education for all and millennium development goals are affected by increased ICT access and use. However, the implementation of ICT is also highly influenced by local circumstances and by "social processes that determine the outcomes and often have political ramifications" (Qureshi, 2009, p. 235). The Ghanaian scholar Gyekye (1997, p. 37) makes a similar comment when he states that technology is a cultural product and that it ideally "should rise from the culture of people, if it is to be directly accessible to a large section of the population and its nuances are to be fully appreciated by them". Technology has always played an important role in development; however, Samoff and Stromquist (2001) claim that while technology can perhaps eliminate inequalities, disparities in society are created by people and not by technology. In view of this, ICT use in South African classrooms will be explored by focusing, in particular, on teachers' capabilities to use ICT and the relevance of language. The research questions that guided the study were as follows:

(1) What is exacerbating or maintaining the digital divide in schools that already have material access to computers?

(2) How do linguistic aspects influence the digital divide in the South African classroom?

The article proceeds as follows: First the local context for ICT use in South African schools is introduced, focusing on cultural complexity and the policy framework. This is followed by a general discussion on the conceptual framework of the study, with emphasis on theories of ICT and development (ICT4D) and the capability approach (CA), together with a clarifying discussion on the concept digital divide. The methodological approach and data analysis are then discussed and finally, the main findings as well as the general limitations and contributions of the study will be explored.

2.   Cultural context

In a global context, ICT is biased and strongly founded on Western cultural hegemony, knowledge, and ideas (van Grasdorff, 2004). Mazrui (1985) has argued that technology can be seen as an alien transplant and ICT can ingrain inequalities and maintain oppression. Requiring universal access does not assure equal opportunities and freedom to use and shape the technology (Herring, 2001; Sen, 1999b). Recognizing the dynamic relationship between local culture and ICT integration, the cultural complexity in South Africa and the use of ICT are worth further attention. Having once been a highly segregated nation, the new South Africa has a progressive constitution and a language policy (Department of Education, 2004b; South African Government, 1996). Despite the emphasis on the equal rights of all ethnic groups and languages, South Africa remains a country of great disparities. It is therefore relevant to find out how cultural aspects intertwine and possibly influence computer use and the digital divide in South African schools. In the following section, a brief discussion of culture and cultural complexity is provided.

2.1   *Culture and language*

Culture can be viewed as the meaning-making of people and by people as members of certain societies (Hannerz, 1992) that is expressed through language and other symbolic systems. Whereas anthropologists define culture as both a universal capacity and a local response to the immediate environment, "culture" is a word without a shared understanding. Partly this is because it relates to practices and belief systems, society and civilization, ideology, and even the notion of truth. Culture is accordingly the interplay between local and global meanings which influences our cultural identity (Kubow, 2009). The concept of culture is not static, and involves cultural complexity (Eriksen, 2007). One of the distinctive aspects of cultural complexity in South Africa is the language dimension. The country has 11 official languages, and its cultural identity is linked to a complex combination of social and ethnic background, history and language. The languages used in South Africa are, furthermore, related to status, class, and political context. Semali (2009, p. 197) claims that, "... language reflects social relationships and social relations, most of which in turn are affected by socioeconomic conditions and the power structure of society. Thus, the socioeconomic and power structures begin to be reflected in the language we utilise".

Within the education system in South Africa, learners are taught in their mother tongue in the first three grades of school (grades one to three).[1] After grade four, however, learners with African home languages participate in English or possibly Afrikaans classes for the rest of their school attendance. Neither adequate support materials nor additional support are provided in the transition period.

The emphasis on mother tongue instruction is not controversial in the Western part of the world, whereas many African countries are still using colonial languages as the language of learning and teaching (LoLT) (Brock-Utne & Skattum, 2009; Kwaa Prah & Brock-Utne, 2009). Comprehensive research on language of instruction (LoI) in Tanzania and South Africa project indicates a strong connection between the home language as the LoI and learners' positive learning processes (Brock-Utne, Desai, & Qorro, 2006; Qorro, Desai, & Brock-Utne, 2008). Some of the unfortunate consequences in terms of low scholastic attainment are high dropout and repetition/failure rates and, in the end, misplacements in the work market (Bamgbose, 2009). When analyzing the LoI situation in South Africa, Herman (2009) claims that it is the lack of support materials together with adequate teacher training that are the main obstacles to greater emphasis on mother tongue instruction in schools. Other scholars such as Alexander (2003), Desai (2000), Heugh (2000), and Nomlomo (2006) have also written exhaustively about the matter.

The compound nature of the South African learners' cultural or linguistic identity also plays an important role in the ways and opportunities learners use ICT, both within and outside of school (Gudmundsdottir & Jakobsdottir, 2009). The linguistic dimension is the one cultural aspect that will be focused on here.

2.2   *The formal policy framework*

In South Africa, progressive ICT policies introducing new technology in the educational system have been launched (Department of Education, 2004a, 2004b; Khanya, 2009b). The intention is to improve the lives of future generations, equip learners and teachers with relevant skills, and ameliorate inequalities. Moreover, there is an emphasis on relevant content, irrespective of the socio-economic background of the learners (Brown & Brown, 2008; Madon, Reinhard, Roode, & Walsham, 2009). Politicians and educational authorities talk about the importance of the nation becoming digitally literate, and in a white paper on e-education in South Africa, Ms. Pandor, who was the minister of education at the time,[2] stated:

> We want to ensure that every school has access to a wide choice of diverse, high-quality communi-
> cation services which will benefit all learners and local communities. The services provided by the
> initiative will enhance lifelong learning and provide unlimited opportunities for personal growth and
> development to all. (Department of Education, 2004b, p. 6)

The white paper on e-education in South Africa emphasizes that the digital divide is also about accessing local content, local websites, and local language content (Department of Education, 2004b).

The National Department of Education is in charge of education across the country. Additionally, each of the nine provinces has its own education department. In the Western Cape Province, the Western Cape Education Department (WCED) launched the Khanya initiative in 2001 to address the increased focus on ICT in education. The aim is that by 2012 every educator in every public school should be "empowered to use appropriate and available technology to deliver curriculum to each and every learner in the Western Cape" (Khanya, 2009b, para 7). This is seen as particularly important with regard to addressing the underlying shortage of teachers, the digital divide, and the lack of skilled labor, and preparing the Western Cape for participation in the knowledge economy (Khanya, 2009b). The Khanya initiative has resulted in the establishment of computer labs in more than 1000 public schools (WCED, 2009), and is well on the way to reaching the ambitious goal of implementing computers in all the approximately 1500 public schools in the province. Despite the high numbers of schools connected to the initiative, and the many positive outcomes due to visionary leaders and motivated and enthusiastic teachers and learners, there are some critical drawbacks to this massive integration

process. Not all of the schools are using the computers successfully, and learners and teachers are struggling when it comes to curriculum delivery.

As for the framework provided in the National Curriculum Statement on Technology (Grade 7), it says that the learner should "be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology" (WCED, 2002). Furthermore, assessment standards are provided for teachers to assess learners' knowledge within three areas: technological processes and skills, technological knowledge and understanding, and finally technology, society, and the environment (WCED, 2002).

3. Conceptual framework

Various researchers have focused on the influence and appearance of the digital divide in different contexts (Czerniewicz & Brown, 2006; van Dijk & Hacker, 2003; Norris, 2001). Moreover, comprehensive research is available on the influence of multilingualism, bilingualism, and the LoI on learning (Bialystok, 2001; Brock-Utne & Hopson, 2005; Skutnabb-Kangas, 2000). However, research on the influence of the home language and LoLT on learners' computer use, their attitudes, and skills, is limited. Additionally, research on ICT in educational contexts that is widely accessible by the research community is for the most part conducted in English-speaking countries in the Western hemisphere.

3.1 *The concept of the digital divide*

Even though the concept of the digital divide is much debated and even contested, it is still widely used to describe the differences between those who have access to ICT and those who do not. Studies from the USA and Europe acknowledge the connection between socio-economic status, class, and computer access (Compaine, 2001; Katz & Rice, 2002). However, while recognizing the initiative in the Western Cape to computerize all public schools, it is at the same time important to note that the digital divide is increasingly related to factors other than merely having *material* access to computers or the Internet (van Dijk & Hacker, 2003; Wasserman, 2002). Czerniewicz and Brown (2005, p. 47) who have done research on the digital divide in South Africa claim that when exploring material access to ICT, it is necessary to find out "their location, availability and adequacy for use (or fitness of purpose)". The study of Langa, Conradie, and Roberts' (2006) on access to, and use of, computers in South Africa show the connection between ICT and wider inequalities in society. ICT can therefore be seen as exacerbating or maintaining existing inequalities.

3.2 *Different divides*

Keniston (2004) recognizes four dimensions of the digital divide, moving from local differences in every country between the rich and the poor, the educated and powerful and the uneducated and marginalized, to the more specific linguistic and cultural divide. Such a divide is connected to the use of English, the dominance of the English language and culture, and the divide it brings in terms of access to and use of knowledge. The third divide is the global divide between the North and the South, or between developed and developing countries. Finally, Keniston mentions the fourth divide as being the product of the growing intra-national digital elite, the *digerati*. These are persons not related to traditional sources of high status in society but with the appropriate skills that are needed to promote ICT.

van Dijk (2006) uses another approach to the digital divide based on differences in access. These are, first, *material access*, which refers to owning computers or having access to network

connections. Second is *mental access*, which includes issues such as motivation, experience, and computer anxiety. Third, van Dijk refers to *skills access*, which is digital competence, support, and user friendliness and, finally, *usage access*, which identifies the utilization and opportunities to use ICT. Similarly, Warschauer (2004) and Warschauer and Matuchniak (2010) add perceptions of access to different resources. The four components of Warschauer's model are access to physical resources, access to digital resources, access to human resources, and access to social resources. Warschauer includes the dimension of language, content, and human resources and moves away from earlier efforts that characterize the digital divide by focusing only on material access.

The emphasis on the use of ICT in education in Africa is relatively new, considering the low material access to computers and limited Internet connections (Etta & Elder, 2005; Soltane, Fluck, Opoku-Mensah, & Salih, 2004; Toure, Tchombe, & Karsenti, 2008). Now that computers are becoming widely accessible throughout the Western Cape, both in township schools and in other schools that are teaching disadvantaged learners, there is still a clear division in the use of and skills connected to ICT when looking beyond the material access criteria (Gudmundsdottir & Jakobsdottir, 2009). This leads us to the significance of the CA and theories of information and communication for development (ICT4D).

3.3   *ICT and development*

In a developmental context, education has been an area of great importance, and the aspect of development has been a part of disputes as far back as the expansion of Europe (Mair, 1984). The Education for All initiative and the Millennium Development Goals indicate the importance of education for greater prosperity in the developing world. The use and integration of ICT has the potential to support human development, and as a result an Information and Communication Technologies Task Force was established to lead the United Nations' ICT strategies for development. The initiative combined the two – education and ICT – when focusing on development. In 2006, the Task Force was replaced with The Global Alliance for ICT and Development (UNDESA-GAID). In one of their recent publications, it is argued that:

> ICT can increase existing social and economic inequalities, particularly if access and use of ICTE [ICT for education] is not equally available to everyone. Implementation of ICTE must be case specific and locally driven, or the development community may risk further isolating impoverished populations rather than promoting inclusion and social advancement. (Gutterman, Rahman, Supelano, Thies, & Yang, 2009, p. 1)

The potential of ICT for disseminating education and reaching out to countries' poorest and most marginalized is acknowledged, but the importance of how ICT is integrated is also relevant.

Traditional development theories originating in the West are biased in the way they view education in a developing context and how they consider the role of ICT in education. One might argue that the Western impact on developing countries is maintained through ICT and globalization (van Binsbergen, 2004). Limited access to publishing opportunities and online information and raw data can, moreover, be viewed in connection with the discussion on knowledge and power (Foucault & Gordon, 1980). Colonial ties are maintained through e-learning platforms, software, and content which is neither localized nor available in local languages. Foucault states that education is the platform where every individual can achieve access to discourse and knowledge. There is, however, a power imbalance in every educational system and educational discourse which is maintained or modified according to the power structures in society (Foucault, 1972). In this sense, South African learners do not have equal opportunities to participate in the education system and to use the opportunities ICT may bring.

A further critique on traditional development theories has been developed by the Nobel laureate Amartya Sen. He provides an alternative focus on development and education, away

from a Western market-oriented focus to a focus on the human aspect of development. Sen defines development through the freedom and opportunities people have (Sen, 1999b). Greatly inspired by justice and equity, he states that the role of education is to enable people to live the lives they want and to increase their choices (Sen, 1992). Access to ICT can therefore be viewed as enabling people to raise their choices in life and peoples' capabilities in terms of what a person can do or can become (Sen, 1999a). It is a part of human empowerment and increased capabilities of the individuals to have access to basic education and knowledge. The deprivation of such capabilities and the lack of opportunities in South African society can furthermore be linked to the issue of poverty as discussed by Sen (1999b).

4.   Research methodology

4.1   *Design and participants*

This study is a comparative case study based on fieldwork in Cape Town, South Africa during 6 months in 2007. Data were gathered in four primary schools, but the main emphasis was on three schools with disadvantaged learners. These three schools have been given the pseudonyms Acadia, Xolani, and Eaglewood. The fourth school, called Freewill, was added in the last part of the fieldwork in order to gain a broader view on the diversity of learners in Cape Town. Freewill differs from the other schools as it was previously for white learners only, even though it now has some learners with other ethnic backgrounds.

The three focal schools (Acadia, Xolani, and Eaglewood) are all connected to the Khanya initiative, and as such the learners and teachers have been using computers for some years. Freewill learners have not received computers or training through Khanya, but with solid support from the parental community and the school board they have a well-equipped computer lab and a designated computer teacher. The schools were selected from a list of possible Khanya schools provided by WCED officials. The final choice of schools was made with location in mind, but most importantly with the idea that they would represent some of the cultural and linguistic complexity of learners in the Western Cape region.

To get an extensive overview of the use of computers and possible divides in the schools, mixed methods were used for data collection and the triangulation of findings. Weekly observations were made in the computer room of the three disadvantaged schools, in-depth interviews with learners, teachers, and principals were conducted, and the learners in all four schools answered a questionnaire focusing on their ICT use and skills.

The selected learners were in Grade 7 and most of them were between 12 and 13 years of age. Despite possible communication (language) difficulties with such young learners, the rationale for not choosing older learners was that the sample would not be as inclusive due to high dropout rates in the disadvantaged groups.

In Table 1, an overview is given of the four schools and participants in this study as well as their language profile at home and in school.

4.2   *Data collection and procedure*

As a part of the qualitative data, observations were conducted in the computer labs, on average, once a week at each of the three focal schools. Field notes were taken focusing on the structure of the lessons and the ICT competence of the teachers and learners.

Thirty-four randomly selected seventh-grade learners in the three Khanya schools were interviewed, in addition to the principals and seventh-grade teachers in the same schools. These interviews were semi-structured, and the interview sessions varied from 20 min to 2 h.

Table 1.   Overview of the schools: number of learners, number of seventh grade learners (number of Grade 7 classes), home language, LoLT, and annual school fee.

School (no. of learners)	No. of seventh-grade learners[a] (no. of seventh-grade classes)	No. of home language (HL) learners in Grade 7[b]	LoLT	Annual school fees in Rand
Xolani (892)	87 (2)	isiXhosa (85) Other (2)	isiXhosa gr.1–3, English from Grade 4	0
Acadia (926)	94 (3)	Afrikaans (46) English (35) Xhosa (8) Other (5)	Parallel Medium Afrikaans and English	460
Eaglewood (260)	31 (1)	isiXhosa (16) Afrikaans (2) English (10) Other (3)	English	650
Freewill (699)	78 (4)	English (67) Afrikaans (7) isiXhosa (6) Other (3)	English	7000

[a]The number of seventh-grade learners is the number of learners who answered the questionnaire. A few learners were missing on the days the questionnaire was handed out in the four schools.
[b]Five learners at Freewill answered that their home language was both English and Afrikaans. In the other three schools, learners did not answer that they had two languages as their home language. The questionnaire was perhaps not specific enough in specifying learners' need to report only their main language. It is, however, quite typical in South Africa for homes to use two or more languages.

Several follow-up interviews were conducted to resolve discrepancies or unclear issues. Moreover, informal conversations with teachers and other staff at the schools were used to triangulate the general findings from the formal interview sessions. In Xolani, the interviews with the learners were conducted with the help of an isiXhosa-speaking interpreter. The interviews were audio-taped, translated and back translated by another isiXhosa-speaking translator to verify the initial version.

All the seventh-grade learners in the three Khanya schools ($n = 212$) as well as the learners in three out of four classes in the fourth school ($n = 78$), a total of 290 learners, answered a questionnaire on their access, use, and skills within school and outside of school. The questionnaire focused on access and the skills learners had both within school and outside school. The questionnaire included 33 questions in total, including several on the language background of the learners, and their attitudes related to LoLT as well as ICT use in general. These questions had been piloted on two seventh grade classes and revised accordingly (Gudmundsdottir & Brock-Utne, in press). Some of the questions had also been used before in a series of studies from 1998 to 2008 in Iceland, mapping the development of computer use and the computer culture in primary and secondary schools in that country (Jakobsdottir, 2008).

4.3   *Data analysis*

The qualitative data were transcribed and thematically coded in NVivo 8 around the themes from the interview guide, such as home use, attitudes, skills, language issues, access outside of school,

and so on. Afterwards, these were coded into sub-themes that emerged during the analysis. The interviews were compared across and between schools to identify differences and similarities. The findings presented here draw mainly from the qualitative data, as the findings from the quantitative data have been discussed elsewhere (Gudmundsdottir & Jakobsdottir, 2009). Moreover, the interview data give a thicker description of the various challenges connected to the local context and the cultural complexity in South Africa.

4.4 *Ethical considerations*

Research clearance was provided by the WCED as well as the Khanya initiative. An observation and procedure plan was made in cooperation with the principals. Parental consent letters were sent out in the three main languages of the learners/parents in the three Khanya schools. In Acadia, these were active consent letters, whereas in Eaglewood and Xolani, they were passive. The principal in Freewill gave permission for the use of the questionnaire in Freewill, but the learners could withdraw their participation if they wished. Classroom observations were also limited in Freewill, and the teachers were only informally interviewed.

5. Findings

5.1 *The importance of teachers and their training*

Teachers in schools connected to the Khanya project receive initial training sessions provided by so-called facilitators. These are contact and support persons between the Khanya initiative and the schools. The duration of these training intervals varied by school and ranged from none in Eaglewood, where the headmaster and computer teacher decided to train the teachers themselves, to training once a week for almost 2 years in Acadia with some months' pause due to construction work at the school (interviews with Desmond, 20 March 2007; Johan, 26 April 2007; Dillan, 2 May 2007).

According to the Khanya websites (Khanya, 2009a), the initial training sessions by the facilitators are focused around the following:

- Teaching basic computer theory and practice;
- Facilitating learning about how to use the computer as a tool in education;
- Integrating technology into the curriculum delivery process; and
- Increasing learning by designing lessons that use instructional technology.

The training sessions are built around eight models that concern basic computer concepts, the Windows operating system, the Internet, electronic mail, file management, word processing, spreadsheets, and presentations.

According to one of the facilitators, they also provide local area network (LAN) administrator training at the Centre for E-Innovation (CEI), as well as teacher training in computer literacy, educational software training, and equipment training such as using a scanner, interactive whiteboard, and so on. The training is mostly done after new labs are opened in schools, but also when there are upgrades or when a school especially requests it (Andrew, personal communication, April 16, 2007). The CEI is the only other departmental resource apart from Khanya providing ICT in-service training for teachers in the province. Its purpose is to improve quality and efficiency in government services by using ICT within the Provincial Government (Cape Gateway, 2006).[3]

During the computer classroom observations, it was clear that most of the activities of the teachers and learners in the computer room included basic computer skills and, to a much lesser degree, specially designed lessons using ICT in curriculum delivery. Part of the

explanation may be that the teachers were mostly new to the technology themselves. The computer teachers in Eaglewood and in Freewill did, however, integrate ICT into the different subject areas.

Many of the teachers struggled with using ICT and found it challenging to use with their learners. William, a teacher in Eaglewood, said, "for me, it is more difficult to get myself sorted for the computer room, yes. I'm not so familiar with the whole technology . . . that's why I have to go in there the day before and get my whole mind set" (22 May 2007). Some of the teachers did not prepare themselves for the classes in the computer room and had minimal interaction with their learners.

When one of the teachers in Xolani was asked to compare the sessions with learners in the computer room and the ordinary classroom, she responded: "it [the computer session] is easier, very easy. It is more hands on, and they [the learners] do whatever they do by themselves. They just work with the instructions on the computers and do as the instruction" (Siphokazi, Xolani, 9 May 2007). This can indicate that the teacher's intervention was limited. The computer sessions might, moreover, be looked upon as program-centered rather than either teacher- or learner-centered, as the lessons were administrated through the few programs in use. Yet other teachers seemed to perceive the classes in the computer room as a break from hectic classroom activities and preparations, using the opportunity to surf the Internet themselves while the learners were solving assignments on the computers.

To aid the integration of ICT, all the Khanya schools had a computer committee consisting of a few teachers. The members received LAN training so that they could assist with basic installations and update the school network. The members are also meant to support colleagues. Several of the computer committee members who were interviewed claimed they had limited time to fulfill their duties. They did not receive extra hours, and one of the members of the computer committee at Acadia said, "we would train them [our colleagues], but it really takes time that we don't have" (Pieter, Acadia, 18 May 2007). Other members of the computer committees at Acadia and Xolani said they offered ad hoc help to those colleagues who requested it, but clearly indicated that they did not have the capacity or time to help in a more systematic way. On a similar note, the Khanya facilitators were not available for support as much as the teachers wanted. One of the Khanya officials admitted that the facilitators were the weakest link in the whole implementation process, seen from the perspective of the WCED (Dennis, 11 May 2007).

None of the schools had any formal plan or training program for newcomers (teachers) in terms of how to use the computers with the learners for curriculum delivery. Menzi, a newcomer at Xolani, describes the need for increased teacher training in the following way:

> The learners they are very interested in computers. We've found out that when the class is supposed to be here, at a certain time. . . it's a challenge because they don't come. The teachers are not interested. They are not computer literate, the teachers. If maybe they can be provided with some computer courses. Maybe the teacher should know that this is the program that will assist you with this and that. (Menzi, Xolani, 16 May 2007)

The lack of support and sufficient training is a challenge, particularly in the disadvantaged schools. Also, in Eaglewood, where computer use has been integrated into the curriculum, the designated computer teacher describes the hesitation shown by teachers to use the computer room as follows: "They are excited about the computer room . . . [silence] . . . they will come in and let their classes in, but they need a bit of encouragement" (Sophia, Eaglewood, 22 May 2007). Sophia and the Eaglewood school administration have focused on the importance of supporting the teachers in their efforts to use ICT with the learners and have held courses for the teachers to train and practice their skills. In Eaglewood and in Freewill, the computer teacher gives support and assists colleagues with different aspects connected to ICT use with their learners.

The digital divide does include giving teachers' appropriate training and raising their confidence in using ICT with learners. The teachers, just as their learners, are not using the technology to a great extent outside of school and need to get the chance to raise their capacity so that using ICT becomes a feasible addition to their teaching practices.

5.2 *Learners' linguistic awareness*

Turning to the learners, it is relevant to explore whether their different language backgrounds can increase or maintain a divide. During the interviews with the learners, they were asked to reflect on whether they would use computers differently if content and software existed in their home language. The answers confirm some of the previous notions of linguistic awareness and linguistic identity. An isiXhosa-speaking learner at Xolani said, "It is easy to talk isiXhosa, but it is not easy to write or read . . . so English is easier" (Zodwa, Xolani, 29 April 2007). When asked what she meant by this, Zodwa explained that the long words in isiXhosa and the clicks are not easy, and that is why she considered English easier. Her reply can also indicate the social desirability in the isiXhosa community to show competence in English. At Eaglewood, an isiXhosa-speaking learner stated, "the more English that I learn, the less isiXhosa I know, and since Grade 1, I do not like isiXhosa that much, so I just like English" (Onke, Eaglewood, 8 May 2007). Another isiXhosa learner said, "I would choose English because we do everything in English and we are advised to speak the English language" (Busi, Xolani, 29 April 2007). These answers point out the strong status of English in South Africa and suggest that isiXhosa, despite being one of the official languages, has less value in the minds of many isiXhosa-speaking learners.

Learners with English as their home language are, moreover, at an advantage, since content on the Internet, the computer interface (platform and software), and instruction in schools is mostly in English. Even though some interfaces are now available in isiXhosa and Afrikaans, these are not provided or easily available in the schools. The English home language learners get all the teaching materials in their home language, whereas the Afrikaans learners only had access to two software programs in their home language. Moreover, one of the Afrikaans-speaking teachers mentioned that the learners can choose between English and Afrikaans when starting the program, but claimed that as soon as advanced features in the program were executed they could only be conducted in English (Pieter, Acadia, 18 May 2007).

The learners at Acadia who followed the Afrikaans stream had very limited access to software in Afrikaans, and some also mentioned the lack of online resources in Afrikaans. One of the Afrikaans-speaking learners argued that she would rather go to the library and find information in Afrikaans than search online and get information in English from the Internet. She added that most of the websites are in English, therefore: "We must translate it to Afrikaans if we must do work or a project . . . because that must be in Afrikaans, because we are in the Afrikaans class" (Christa, Acadia, 3 May 2007).

One might assume that the isiXhosa-speaking learners were those who are influenced the most by the lack of content and software in their home language. However, the majority of the isiXhosa-speaking learners instead argued for the importance of learning English. This supports the findings by other scholars about the myth of English being the language of technology (Brock-Utne, 2005; Jokweni, 2004). The Afrikaans-speaking learners may have been more aware of the importance of having access to content in their home language. Several of them claimed that they would like to access more material in Afrikaans, especially on the Internet. In addition, these learners appeared to be more confident in their home language than the isiXhosa-speaking learners.

The learners at Eaglewood and Freewill had a slightly different experience when using computers in school, most likely because they have been taught in English since Grade R (the

pre-primary school year) or Grade 1. Therefore, they have from the first day of school adapted to the English vocabulary and terminology. At Acadia, the learners are taught in either English or Afrikaans, according to their choice, from Grade 1. The learners at Xolani, however, face a shift of instruction language after Grade 3 from their mother tongue, isiXhosa, to English. This raises serious challenges for the isiXhosa-speaking learners, since English is an unfamiliar language both at home and in their immediate surroundings.

5.3   *Teachers' and learners' survival practices*

Several scholars have written about the *survival strategies* of code switching in African class-rooms (Holmarsdottir, 2005; Ramsay-Brijball, 2002). Teachers use code switching methods to make lessons understood for learners by switching between the LoI and learners' familiar language/home language. From my observations, it was noticeable that the learners who speak English as their second or third language have difficulties understanding instructions when they receive them only in English. Similarly, these learners experienced difficulties in the computer room when met with computer platforms, software, and instructions in English.

At Eaglewood, one of the teachers, William, has experienced the benefits of being multi-lingual and being able to speak isiZulu and English. His mother tongue is English, but growing up on a farm and teaching for decades at farm schools in Zululand enabled him to understand and speak isiZulu. isiZulu is close to isiXhosa, the language of many of his learners. He sees the clear benefits and admits that he code switches when needed: "If necessary, I will be able to use a word from their language to unlock the meaning, and once they understand, they get excited" (William, Eaglewood, 22 May 2007). When asked whether it would benefit learners to have more software and content in their mother tongue, he agreed that it would be an absolute bonus for learners and their learning. At Eaglewood, there were also learners with an Afrikaans background. William continued: "A lot of the kids are confused by a lot of things; they do not understand quite what I mean, so if I have an equivalent word that I can use for them to under-stand better or an expression, then I use it" (William, Eaglewood, 22 May 2007). Similar to teachers in the township school Xolani, the teachers at Eaglewood also said that they code switch to help learners understand the lessons.

Siphokazi added that code switching between isiXhosa and English is widely used at the school to explain the nature of assignments and the lessons. She claimed that the problems are tied to using a language other than the learners' home language during the lessons, which makes the learners become passive, and the teaching becomes less learner-centered and more teacher-oriented (Siphokazi, Xolani, 9 May 2007).

5.4   *Language use in the computer room*

When exploring the use of computers in the four schools with regard to access to digital resources (language and content), there are clear differences between the schools. The lessons in the computer room are similar to lessons in other subjects and influenced by the availability of proper resources. Access to digital resources in a familiar language can be viewed as an imperative for learners' level of understanding in the computer room. Similarly, when it comes to teaching a subject using ICT, in addition to being taught in a foreign language, the lear-ners face a double literacy challenge. This implies that learners may not fully comprehend the subject taught in English and with a computer platform and software in English.

The learners at Xolani speak isiXhosa at home and undoubtedly experienced the greatest difficulties in terms of language in the computer room. Menzi, a teacher in Xolani, stated that

everyone experiences difficulties with the language and it is a barrier for learning (16 May 2007). He argued that in the computer room the situation is even worse:

> We have to guide them and then to interpret the words for them. For example, you have to tell them "click on start", but then they get stuck again. Because of the language, they get stuck. The language is very problematic for our schools [township schools] in general. (Menzi, Xolani, 16 May 2007)

Siphokazi said, "So it is mostly the teachers that are talking, more than the learners because of the language ... Most of the learners are illiterate as they try to only speak the language of the school [English]" (Siphokazi, Xolani, 9 May 2007). Siphokazi's statement also coincided with the observations in the computer room that, when speaking English, the learners became more passive and the teaching became more teacher-centered or even program-centered, meaning that the elements in the program ruled the lesson. Moreover, during observations in Xolani, Acadia, and Eaglewood, I often heard learners discuss assignments in their home language while typing their answers on the computer in English.

At Acadia, two Grade 7 classes are taught in English, and one Grade 7 class is taught in Afrikaans. In response to the questions about software and material in the home language of the learners, the teacher of the Afrikaans class answered that he was sure that the learners would gain enormously from getting more materials in their home language. He continued: "But if it is in English, then the terminology is not the same. So, it won't be beneficial to them ... they will be able to see and hear, but that is it ... they won't be able to really *use* the computer" (Pieter, Acadia, 18 May 2007). This points out some of the challenges teachers and learners are facing. Learners may even become more disadvantaged by only "seeing and hearing" as opposed to becoming active in using computers for their own knowledge construction.

In spite of the language challenges mentioned by the teachers, the learners were generally positive toward the English language. The high status of English is continually promoted through teaching in English. This, however, does not support African-language speakers in valuing their own languages and increases the social desirability of the learners to speak good English, especially the isiXhosa learners who were also encouraged to speak English. Zama, a learner at Xolani, said, "the teacher tells us to speak more English than Xhosa so that we can get used to English" (29 April 2007).

From these findings, one may argue that the strong status of English is maintained through LoLT and ICT integration using software and platforms primarily in English. In multilingual South Africa, English, isiXhosa, and Afrikaans are, however, not mutually exclusive. It is important for all learners to know English, but equally important that they value their own language and culture. English taught as a second language and a special subject is particularly important for South African learners in today's global knowledge society, but for them to fully master the use of ICT it has to be put in a local context, which includes the local language.

6.   Discussion and conclusion

Two underlying explanations have been discussed when seeking to answer the question of what is influencing the digital divide in schools that already have material access to computers. The importance of raising the ICT capability of the teachers and their opportunities to obtain training, and the role of language in conjunction with learners' ICT use are the focus of this discussion.

Janssens-Bevernage, Cornille, and Mwaniki (2005, p. 159) state from their study in Eastern Africa that the most important shift needed for successful ICT integration in the region is to change computer use from "learning to use to using to learn." Similarly, Zheng (2009) mentions the shift in dichotomy from that between the haves and have-nots to that between the cans and

cannots. The same applies across Southern Africa. For teachers to be able to use ICT and connect ICT to didactic practices or meaningful pedagogy in the classroom, they must acquire the necessary competence. This is especially apparent for teachers in disadvantaged neighborhoods who do not have home access and are completely dependent on access in school.

As for the learners, it is of great benefit if the LoI, the language of the computer platform/software, and the home language of the learner is one and the same. Without an emphasis on learners' home language in school, learners can risk falling into a double literacy trap when they are expected to both learn a subject and take on new skills through the medium of an unfamiliar language.

Research on ICT therefore requires a perspective of understanding emerging technology as not simply a technology or a tool, but as an integral aspect of the socio-cultural surroundings within the community, including that of language and policy initiatives. Moreover, policy-makers do not sufficiently highlight the language issue when focusing primarily on material access to ICT. Learners and their teachers experience clear challenges in the classroom, but to proactively fight the existing divides, ICT integration will have to include local context and consideration for local languages. The learners and teachers in South Africa need to have the freedom to choose and the capability to use ICT in their own language.

The main limitation of this study stems from the methodological challenges connected to the complexity and choice of the sample. The variety of the school sample could have been greater, and the schools do not represent all aspects of cultural and linguistic complexity in the province. Furthermore, an experimental component with regard to the use of software and computer platforms in different languages would add value to the findings.

Data analysis, as well as the transferability of findings, is challenging when handling a sample of schools which differ in composition, both regarding location and size. Moreover, learners have multi-lingual and multi-ethnic backgrounds linked to class identity, status, and other economic and/or social disadvantages. It is therefore highly complicated, if not unattainable, to distinguish between the cultural and social factors and define exactly how they relate to each other. The findings should therefore only be seen as an indication of some of the challenges connected to the digital divide and how cultural and linguistic aspects can exacerbate or maintain it. As for transferability, the intention is not to provide an overall explanation of the digital divide in South Africa or the wider context, but rather to offer a thick description of some of the contextual constraints South African learners and teachers are facing when integrating ICT into their practices.

Regardless of the limitations, the study does emphasize the importance of taking into account the cultural and linguistic aspects of computer implementation and ICT use in education. It provides an approach to the digital divide which is connected to wider social inequalities in South Africa. Yet, it can also be a lesson to other countries in an increasingly multi-cultural and multi-lingual world, where teachers are facing disadvantaged groups such as refugees, minority populations, and other learners who do not have the same cultural background and opportunities to use computers as the majority population do. As such, the study points out some of the cultural and linguistic challenges of ICT integration and development in schools. Future studies are nevertheless needed which include stronger design that can specifically identify and unpack the cultural complexity in computer use in education.

Acknowledgements

feedback on the content of the article. Finally, many thanks to all of the participants in the study who shared their time and everyday lives with me and gave me insight into the South African education system.

Notes

1. That is, if they are not in a special English medium school, which are often more prestigious and more expensive to attend.
2. Since May 2009, the Minister of Science and Technology.
3. According to K. Sherman, an ICT education specialist at the University of Cape Town, the focus of CEI was shifted by the new government in the Western Cape in 2009 to work on ICT training for other government departments such as health and not education. Other pre- or in-service courses for teachers on ICT-related skills have been channeled through universities, which offer training courses, often short modules taught through distance learning, which is challenging for part of the students due to access issues (K. Sherman, personal communication, April 13, 2010).

Note on contributor

Greta Björk Gudmundsdottir is a research fellow and doctoral candidate in Comparative and International Education (CIE) at the University of Oslo, Norway. Her research interests are ICT in education, the digital divide and the issue of LoI in Africa. Gudmundsdottir is presently working on the use of ICT in disadvantaged schools in South Africa.

References

Alexander, N. (2003). The African renaissance, African languages and African education with special reference to South Africa. In H.E. Wolff (Ed.), *Tied tongues* (pp. 21–37). Münster, Germany: LIT.

Bamgbose, A. (2009). Foreword. In B. Brock-Utne & I. Skattum (Eds.), *Language and education in Africa. A comparative and transdisciplinary analysis* (pp. 13–15). Oxford: Symposium Books.

Bialystok, E. (2001). *Bilingualism in development: Language, literacy & cognition.* Cambridge: Cambridge University Press.

van Binsbergen, W. (2004). Can ICT belong in Africa, or is ICT owned by the North Atlantic region? In W. van Binsbergen & R. van Dijk (Eds.), *Situating globality. African agency in the appropriation of global culture* (pp. 107–146). Leiden: Brill.

Brock-Utne, B. (2005). But English is the language of science and technology. On the language of instruction in Tanzania. In B. Brock-Utne, Z. Desai, & M. Qorro (Eds.), *LOITASA Research in progress* (pp. 160–188). Dar es Salaam, Tanzania: KAD.

Brock-Utne, B., Desai, Z., & Qorro, M. (Eds.). (2006). *Focus on fresh data on the language of instruction debate in Tanzania and South Africa.* Cape Town: African Minds.

Brock-Utne, B., & Hopson, R. (Eds.). (2005). *Languages of instruction for African emancipation: Focus on postcolonial contexts and considerations.* Dar es Salaam, Tanzania and Cape Town: Mkuki na Nyota and The Centre for Advanced Studies of African Society.

Brock-Utne, B., & Skattum, I. (Eds.). (2009). *Languages and education in Africa. A comparative and transdisciplinary analysis.* Oxford: Symposium Books.

Brown, W., & Brown, I. (2008). Next generation ICT policy in South Africa: Towards a human development-based ICT policy. In C. Avgerou, M.L. Smith, & P. van den Besselaar (Eds.), *Social dimensions of information and communication technology policy* (Vol. 282, pp. 109–123). Boston: Springer.

Cape Gateway (2006, July 12). E-Innovation: overview. Retrieved April 14, 2010, from http://www.capegateway.gov.za/eng/your_gov/14311

Colle, R.D., & Roman, R. (2003). ICT4D: A frontier for higher education in developing nations. *African and Asian Studies, 2*(4), 381–420.

Compaine, B.M. (2001). *The digital divide: Facing a crisis or creating a myth?* Cambridge, MA: The MIT Press.

Czerniewicz, L., & Brown, C. (2005). Access to ICT for teaching and learning: From single artefact to interrelated resources. *International Journal of Education and Development Using Information and Communication Technology, 1*(2), 42–56.

Czerniewicz, L., & Brown, C. (2006). *The virtual Möbius strip. Access to and use of information and communication technologies (ICTs) in higher education in the Western Cape*. (No. 1. Report series). Cape Town: Centre for Educational Technology.

Department of Education (2004a). *National education information policy*. Pretoria, South Africa: Department of Education.

Department of Education (2004b). Whitepaper on e-education. Transforming learning and teaching through Information and Communication Technologies (ICTs). Retrieved October 10, 2008, from http://www.capegateway.gov.za/eng/publications/white_papers/2004/93586

Desai, Z. (Ed.). (2000). *Mother tongue education: The key to African language development? A conversation with an imagined South African audience*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

van Dijk, J. (2006). Digital divide research, achievements and shortcomings. *Poetics*, *34*(4–5), 221–235.

van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The Information Society*, *19*(4), 315–326.

Eriksen, T.H. (2007). Complexity in social and cultural integration: some analytical dimensions. *Ethnic and Racial Studies*, *30*(6), 1055–1069.

Etta, F.E., & Elder, L. (Eds.). (2005). *At the crossroads: ICT policy making in East Africa*. Nairobi, Kenya: IDRC-CRDI.

Foucault, M. (1972). *The archaeology of knowledge and the discourse on language*. New York: Pantheon Books.

Foucault, M., & Gordon, C. (1980). *Power/knowledge: Selected interviews and other writings 1972–1977*. Brighton: Harvester Press.

van Grasdorff, E. (2004). *African renaissance and discourse ownership in the information age*. Hamburg: Lit Verlag.

Gudmundsdottir, G.B., & Brock-Utne, B. (in press). An exploration of the importance of piloting and access as action research. *Journal of Educational Action Research*, *18*(4).

Gudmundsdottir, G.B., & Jakobsdottir, S. (2009). A digital divide: Challenges and opportunities for learners and schools on each side. In H. Holmarsdottir & M. O'Dowd (Eds.), *Nordic voices* (pp. 173–201). Rotterdam: Sense Publishers.

Gutterman, B., Rahman, S., Supelano, J., Thies, L., & Yang, M. (Eds.). (2009). *White Paper. Information & communication technologies (ICT) in education for development*. New York: Global Alliance for ICT and Development.

Gyekye, K. (1997). Philosophy, culture, and technology in the postcolonial. In E.C. Eze (Ed.), *Postcolonial African philosophy: A critical reader* (pp. 25–44). Oxford: Blackwell.

Hannerz, U. (1992). *Cultural complexity: Studies in the social organization of meaning*. New York: Columbia University Press.

Herman, H.D. (2009). The start and progress of a language of instruction research project in Africa – the spirit of Bagamoyo. In B. Brock-Utne & G. Garbo (Eds.), *Language and power* (pp. 182–195). Dar es Salaam: Mkuki na Nyota.

Herring, S. (2001). Foreword. In C. Ess & F. Sudweeks (Eds.), *Culture, technology, communication: Towards an intercultural global village* (p. XIV, 355 s). Albany, NY: State University of New York Press.

Heugh, K. (2000). The case against bilingual and multilingual education in South Africa (PRAESA Occasional Papers No. 6). Cape Town: PRAESA.

Holmarsdottir, H. (2005). *Literacy in two languages? Implementing the language in education policy (LiEP) in South African primary schools* (Unpublished doctoral dissertation). University of Oslo, Oslo, Norway.

Jakobsdottir, S. (2008). School computer culture: Ongoing series of studies on computer use of Icelandic children and adolescents, their computer-related attitudes and skills. Retrieved January 11, 2009, from http://soljak.khi.is/computerculture/

Janssens-Bevernage, A., Cornille, B., & Mwaniki, N. (2005). Integrating ICT in teacher training: Reflections on practice and policy implications. In F.E. Etta & L. Elder (Eds.), *At the crossroads: ICT policy making in East Africa* (pp. 153–165). Nairobi, Kenya: East African Educational.

Jokweni, M. (2004). Problems associated with the creation of isiXhosa terms for special subjects: The case of geography and mathematics. In B. Brock-Utne, Z. Desai, & M. Qorro (Eds.), *Researching the language of instruction in Tanzania and South Africa* (pp. 169–176). Cape Town: African Minds.

Katz, J.E., & Rice, R.E. (2002). *Social consequences of internet use: Access, involvement, and interaction*. Cambridge, MA: MIT Press.

Keniston, K. (2004). The four digital divides. In K. Keniston & D. Kumar (Eds.), *IT experience in India. Bridging the digital divide* (pp. 11–36). New Dehli, India: Sage.

Khanya (2009a). Outcomes for ICT training at Khanya schools. Retrieved August 31, 2009, from http://www.khanya.co.za/projectinfo/docs/edutraining.doc

Khanya (2009b). Summary of the project. Retrieved June 19, 2009, from http://www.khanya.co.za/projectinfo/?catid=32

Kubow, P.K. (2009). Democracy, identity, and citizenship education in South Africa: Defining a nation in a post-colonial and global era. In J. Zajda, H. Daun, & L.J. Saha (Eds.), *Nation-building, identity and citizenship education: Cross-cultural perspectives* (pp. 43–54). London: Springer.

Kwaa Prah, K., & Brock-Utne, B. (Eds.). (2009). *Multilingualism – An African advantage. A paradigm shift in African languages of instruction policies*. Cape Town: CASAS.

Langa, Z., Conradie, P., & Roberts, B. (2006). Slipping through the Net: Digital and other communication divides within South Africa. In U. Pillay, B. Roberts, & S. Rule (Eds.), *South African social attitudes. Changing times, diverse voices* (pp. 131–149). Cape Town: Human Sciences Resource Council (HSRC).

Law, N., Pelgrum, W.J., & Plomp, T. (Eds.). (2008). *Pedagogy and ICT use in schools around the world. Findings from the IEA SITES 2006 study*. Hong Kong: Comparative Education Research Centre.

Madon, S., Reinhard, N., Roode, D., & Walsham, G. (2009). Digital inclusion projects in developing countries: Processes of institutionalization. *Information Technology for Development*, *15*(2), 95–107.

Mair, L. (1984). *Anthropology and development*. Houndmills, UK: Macmillan Education.

Mazrui, A.M. (1985). Africa between ideology and technology: Two frustrated forces of change. In P. O'Meara & G.M. Carter (Eds.), *African independence: The first twenty-five years* (pp. 275–300). Bloomington, IN: Indiana University Press.

Nomlomo, V. (2006). Parents' choice of the medium of instruction in science: A case of one primary school in the Western Cape, South Africa. In B. Brock-Utne, Z. Desai, & M. Qorro (Eds.), *Focus on fresh data on the language of instruction debate in Tanzania and South Africa* (pp. 112–137). Cape Town: African Minds.

Norris, P. (2001). *Digital divide: Civic engagement, information poverty, and the Internet worldwide*. Cambridge University Press.

Qorro, M., Desai, Z., & Brock-Utne, B. (Eds.). (2008). *LOITASA: Reflecting on phase I and entering phase II*. Dar es Salaam: E&D Vision.

Qureshi, S. (2009). Assessment of the social factors in information and communication technology access and use. *Information Technology for Development*, *15*(4), 235–236.

Ramsay-Brijball, M. (2002). Code-switching and the lives of Zulu first-language speakers. In F.R. Owino (Ed.), *Speaking African. African languages for education and development* (pp. 213–221). Cape Town: CASAS.

Samoff, J., & Stromquist, N.P. (2001). Managing knowledge and storing wisdom? New forms of foreign aid? *Development and Change*, *32*(4), 631–656.

Semali, L.M. (2009). Indigenous pedagogies and language for peace and development. In B. Brock-Utne & G. Garbo (Eds.), *Language and power. The implications of language for peace and development* (pp. 196–207). Dar es Salaam: Mkuki na Nyota.

Sen, A. (1992). *Inequality reexamined*. Oxford University Press.

Sen, A. (1999a). *Commodities and capabilities*. Oxford University Press.

Sen, A. (1999b). *Development as freedom*. Oxford University Press.

Skutnabb-Kangas, T. (2000). *Linguistic genocide in education – or worldwide diversity and human rights?* Mahwah, NJ: Lawrence Erlbaum Associates.

Soltane, K.B.B., Fluck, N.O., Opoku-Mensah, A., & Salih, M.A.M. (Eds.). (2004). *Africa networking: Development information ICTs and governance*. Addis Ababa: International Books & Economic Commission for Africa.

South African Government (1996). Constitution of the Republic of South Africa. Retrieved January 10, 2008, from http://www.info.gov.za/documents/constitution/1996/index.htm

Toure, K., Tchombe, T.M.S., & Karsenti, T. (Eds.). (2008). *ICT and changing mindset in education*. Bamenda: Langaa Research & Publishing for ERNWACA/ROCARE.

Unwin, T. (Ed.). (2009). *ICT4D information and communication technology for development*. Cambridge University Press.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the digital divide*. Cambridge, MA: MIT Press.

Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education*, *34*(1), 179–225.

Wasserman, H. (2002). Between the local and the global: South African languages and the Internet. *African and Asian Studies*, *1*(4), 303–321.

WCED (2002). Revised national curriculum statement grades R-9 (schools). Grade seven. Learning area: Technology. Retrieved April 14, 2010, from http://wced.school.za/ncs/grade7/tech_gr7.html

WCED (2009). WCED celebrates 1000 Khanya schools. Retrieved September 1, 2009, from http://wced.wcape.gov.za/comms/press/2009/41_khanya.html

Zheng, Y. (2009). Different spaces for e-development: What can we learn from the capability approach? *Information Technology for Development*, *15*(2), 66–82.

IV

From digital divide to digital equity: Learners' ICT competence in four primary schools in Cape Town, South Africa

G.B. Gudmundsdottir
Institute for Educational Research, University of Oslo, Norway

ABSTRACT

This study explores factors influencing the digital divide in four schools in Cape Town, South Africa. Three of the schools are for disadvantaged learners whereas the fourth was previously for whites only. All the schools use ICT in their curriculum delivery and thereby support the emphasis of provincial educational authorities on ICT access for all learners and teachers. Seventh-grade learners (*N* = 290) as well as their class teachers and principals participated in the study which focused on factors inside and outside of school which affected learners' ICT competence, and hence the digital divide. Data were collected through interviews, observations and questionnaires. Learners' ICT competence was compared between and across schools in relation to gender, home access and home language in addition to support and training possibilities for the teachers. The main findings indicate that, despite substantial efforts by educational authorities to increase ICT access for learners and teachers in public schools in Cape Town, when learners' ICT competence is compared, digital equity has not been reached. In order to increase digital equity and decrease the digital divide, a renewed policy focus is needed which puts greater emphasis on addressing the severe inequalities of the learners within their school environment as well as outside of school, taking their home situation into consideration to a greater extent.

Keywords: *Capability approach; ICT competence; school use; home access; home language; digital divide; digital equity*

INTRODUCTION

South Africa as a nation is characterised by inequality trends deeply rooted in its history of apartheid. These inequalities include income and wealth inequalities as well as disparity in accessing education, health care, housing and other social infrastructure (Bloch 2009; Chisholm 2004; Fiske & Ladd 2004; Soudien 2004). One aspect of the disparity within education includes access and use of information and communication technology (ICT) which is often connected to the concept of a digital divide. The term "digital divide" is defined in various ways, and its use and meaning are strongly debated. In general, the term has been used to describe the mismatch in access to and use of ICT (Compaine 2001; Norris 2001; van Dijk 2005; Warschauer 2004). The focus of this study is the digital divide when exploring learners' access to and utilization of ICT.

Emphasis on computer access has accelerated in South African schools in recent years. At the same time, greater demands are placed on learners and their teachers to use ICT in learning and the curriculum delivery of different subjects (Department of Education 2004a, 2004b; Miller, Naidoo & Van Belle 2006). Likewise, educational authorities in the Western Cape Province have aimed at increasing access to ICT for all learners and teachers to empower previously disadvantaged[1] learners and teachers and to correct the existing ICT disparity (Western Cape Education Department 2003). The Western Cape Education Department (WCED) established the Khanya initiative in 2001. Its goal was to expose all learners and teachers in public schools to ICT and increase their ICT competence. However, studies have shown that access to computers at home is increasingly playing a role in scholarly debates on the digital divide (Stevenson 2008). In South Africa, home access to computers is largely influenced by class divisions, and not common

for the majority of people. The less advantaged part of the population does not own personal computers, whilst the more affluent households have steady computer access (Langa, Conradie & Roberts 2006; Sayed 1998).

When the ICT competence of learners is explored, many factors need to be considered, including their socio-economic background, gender, education and training, location and language. All of these can be a part of explaining the existing digital divide and the use of ICT. This article reports findings from a study conducted in four schools in Cape Town on seventh-grade learners and their access to, use of and competence in ICT. Despite ICT access at school, individual differences and home access can affect learners' use and skills. In this article, the aim is to identify some of the factors within school (internal) and outside of school (external) that can help explain differences in learners' computer use and ICT skills and thus increase understanding of the digital divide in South African classrooms.

DIGITAL DIVIDE AND CAPABILITIES

As discussed earlier, the term "digital divide" is often used to describe inequalities in access to and use of ICT. Thomas and Parayil (2008) claim, however, that ICT policy documents often lead to a focus on the mere lack of material access to computers. This implies that providing access by either increasing the number of computers and/or giving learners equal time in the computer room does not automatically lead to increased use (Chigona, Mbhele & Kabanda 2008). Chigona et al. (2008) underline the importance of research going beyond simple access definitions by including issues such as literacy, language and education as well as focusing on excluded groups. Chen and Wellman (2004, p.39) argue that:

> *people, social groups and nations on the wrong side of the digital divide may be increasingly excluded from knowledge based societies and economies.*

A digital divide can therefore be referred to as the lack of access to necessary material, human and social resources in order to be able to use computers in a meaningful way (van Dijk & Hacker 2003; van Dijk 2006; Warschauer 2004; Warschauer & Matuchniak 2010).

In this study, an accessibility and learners' ICT competence perspective is adopted, bearing in mind Sutton's (1991) definition of equality and equity in the context of computer access and use. Sutton asserts equality refers to parity in access to and use of computers or the internet in quantitative terms whereas equity is a qualitative property referring to justice or fairness in use and opportunities. Equity involves changing aspects and actions taken that particularly benefit disadvantaged groups in order to increase their access and use. Likewise, the term "ICT competence" will be used together with the term "ICT skills", which contains a slightly narrower meaning. ICT competence is understood to involve basic skills in ICT and

> *the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet (European Union 2006, p.L394/315).*

To address the digital divide, many nations have increased ICT access for learners in schools. UNESCO states that empowering people through "information and media literacy" is an essential precondition for equitable access and inclusive knowledge societies (UNESCO 2010). Global initiatives such as the 'One Laptop per Child' and the 'Hole in the Wall' global project exemplify initiatives to increase ICT access for disadvantaged children in Africa and South Asia (DISE 2010; Hole in the Wall 2010; One Laptop per Child 2010). DiMaggio, Hargittai, Celeste and Shafer, however, point out the importance of factors such as gender, ethnicity, location, age,

education, income, employment and family structure in connection with computer use and skills (DiMaggio et al. 2004). Thomas and Parayil (2008) also note that socially disadvantaged classes' ICT competence is hindered not only by access but also by other factors such as low education and lack of specific skills which may actually widen existing inequalities. When exploring the digital divide, ICT competence and utilisation in relation to social hierarchies are therefore important players and add a dimension to the discussion. Indeed, Chen and Wellman (2004) claim that the proliferation of internet use in developing countries has statistically narrowed the digital divide in terms of material access but is still substantial or even greater due to lack of skills.

During the 1990s, research in western settings showed distinct gender differences in computer use and skills (see Jakobsdottir 1996, 1999). Current studies which have focused on the effects of gender on variance in ICT use show that gender differences still exist even though they are not as clear as before (Banerjee et al. 2005; Cotten, Anderson & Tufekci 2009; Jackson et al. 2008; Nsibirano 2009; Sanders 2006; Volman et al. 2005).

Moreover, Attewell and Battle (1999) have studied home access in connection with school performance. They found that, when comparing children's home access, children from low socio-economic status (SES) homes gained considerably less than children from high SES homes. Selwyn's (1998) study on the effects of using a home computer on learners' educational use of ICT revealed that those having access at home gained considerable advantage as evidenced in his report even though this was not always connected to actual skill level but more to positive attitudes towards computer use (Selwyn 1998). Nevertheless, Cuban (2001) asserts that material access to ICT in schools does not guarantee effective use or ICT competency.

According to the capability approach (CA),

> *two persons with the same actual capabilities and even the same goals may end up with different outcomes because of differences in strategies or tactics that they respectively follow in using their freedoms (Sen 1992, p.82).*

In that way, computer skills or capabilities can be argued to be central for learners' educational gain, but the way the learners utilise their capabilities is influenced by conditions at home and in school. The CA distinguishes people's capabilities and functioning, which is defined as

> *an achievement, whereas a capability is the ability to achieve. Functionings are, in a sense, more directly related to living conditions, since they are different aspects of living conditions. Capabilities, in contrast, are notions of freedom, in the positive sense: what real opportunities you have regarding the life you may lead (Sen, Hawthorn & Muellbauer 1988, p.36).*

This study is founded on the CA to development and focuses on the difference between those being able to use ICT, the "cans" and "can nots", instead of the "haves" and "have-nots". The CA is used in view of its intensive use in scholarly work on ICT and development to explain the inequalities within ICT use and existing divides (Liu, Cornish & Clegg 2007; Thomas & Parayil 2008; Wresch 2009).

CA also allows a wide focus unlike the traditional method of perceiving the information society and development merely through a focus on growth in infrastructure, number of internet hosts, tele-density and so on (Alampay 2006). When Sen (1997) emphasises human capability as the ability for people to lead the lives they have reason to believe can enhance their choices, he argues that education can increase an individual's human capital. Every person's capabilities influence however the freedom one has to lead one's life and make choices (Sen 1997). Furthermore, individual differences influence peoples' skills, capabilities and freedoms when

using ICT (Alampay 2006; Robeyns 2005; van Dijk & van Deursen 2009). Zheng (2009) similarly agrees when applying the CA approach to ICT in a development context that users are not viewed as passive receivers in economic progress based on technological utilities but are rather connected to the needs and expectations in the users' social, cultural and historical environment.

Thus, from a CA perspective, the following research questions have guided the study: Which factors inside and outside of school significantly affect the digital divide? How do these factors affect the ICT skill level of learners and their capabilities?

METHOD

Design

The paper is based on fieldwork conducted in four schools in Cape Town, South Africa. The data collection was conducted during the first two semesters in 2007, from January to July. A mixed-method approach was used to gather data in order to provide a broad understanding and comprehensive analysis of the research problem. The concurrent mixed method approach was used (Creswell 2009) as qualitative and quantitative data were collected concurrently and used for analysing and interpreting the findings and cross validation. The qualitative methods were classroom observations and interviews which provided in-depth information. The quantitative data were collected with a questionnaire and widened the scope of the data material.

Participants and school context

The primary focus was on three schools for disadvantaged learners, which signify that the learners are black and coloured. These schools were given the pseudonyms Acadia, Eaglewood and Xolani. A school, Freewill, formerly for white learners only, was added to broaden the digital divide spectrum and to discover the challenges different learner groups in Cape Town face. All the schools in this study have addressed equality in ICT access by increasing material access to computers. However, the participating schools should not be considered exhaustive or representative of all schools in Cape Town or South Africa. Neither should they be considered to reveal extreme examples of each side of the ICT skills continuum in Cape Town. A pilot study in one township school and one previously white school was more revealing of such extremes (Gudmundsdottir & Brock-Utne 2010).

Thirty-four randomly selected learners participated in the interviews: 14 learners from Acadia (eight from the Afrikaans class and six from the two English classes), 10 learners from Eaglewood and 10 from Xolani. The principals plus two teachers from each of the disadvantaged schools were interviewed as well. In total, 290 seventh graders answered a questionnaire, the majority of seventh graders in the participating schools: 75% of the seventh graders in Freewill, 89% of the learners in Xolani and Eaglewood and 91% of the seventh graders in Acadia.

The schools were selected from a list of Khanya schools, the ICT initiative within the WCED; all were contacted by e-mail before the data collection and fieldwork were performed. The criteria for choosing schools were that the learners should have some prior experience using ICT, they should reflect the linguistic diversity of the learner group in Cape Town and they should preferably use different languages as language of learning and teaching (LoLT). These sample criteria were chosen after the pilot study which revealed the importance and severe challenges of linguistic diversity in education in South Africa (cf. Gudmundsdottir & Brock-Utne 2010). Moreover, a move away from sensitive race or ethnic distinctions which were previously used in South Africa when categorising learners was considered important. The interviewed learners were randomly chosen from the seventh-grade classes after all the learners had returned a parental consent form.

The schools are located in different areas of Cape Town, which can indicate the socio-economic background of the learners (see Table 1). The location of the schools also partly defines the quintile[2] of the school, which again defines the school fees learners need to pay. Since state subsidies are higher in schools for disadvantaged learners (Xolani, Acadia and Eaglewood) than in the former white school (Freewill), the parents pay higher school fees to compensate for lower state subsidies. This excludes many of the disadvantaged learners from attending former white schools in the affluent areas of the city. School fees influence equipment and resources within the school (for example, the number of teacher positions per learner, class size, book stock and number of computers). The location of the school also defines the dominant language within and surrounding the school and partly the SES as well as the home language (HL) of the learners. The schools moreover differ in size. Acadia and Xolani are large. Whereas the 98 learners in grade 7 in Xolani are placed in two classes, the 103 learners in seventh grade in Acadia are divided into three classes. Eaglewood is a small school with only one class for each grade level. In grade 7, there were 35 learners. In Freewill, there were four grade 7 classes with approximately 26 learners in each. In all of the schools, there was one computer room. The number and size of the classes indicate some of the differences in resources and material access to computers. Whereas in Xolani two to three learners had to share one computer, the learners in Freewill each had a computer to work on.

Table 1*: The context of the school*

School name and no. of learners (no. of 7th-grade classes)	Location of school	Total no. of 7th grade learners (No. of 7th graders answering the questionnaire) N = 290[3]	Home language speakers in gr. 7[4] N = 282	Language of learning and teaching	Annual school fees in South African Rand (in 2007)
Xolani 892 (2)	Township school in central Cape Town	98 (87)	isiXhosa (85)	isiXhosa gr. 1-3, English from grade 4	0
Acadia 926 (3)	Eastern suburbs of Cape Town, Afrikaans-speaking neighbourhood	103 (94)	Afrikaans (46) English (35) isiXhosa (8)	Parallel medium Afrikaans and English	460
Eaglewood 260 (1)	Southern suburbs of Cape Town. English-speaking neighbourhood, but majority of learners live in surrounding townships	35 (31)	isiXhosa (16) Afrikaans (2) English (10)	English	650
Freewill 699 (4)	Southern part of Cape Town, English-speaking affluent area	104 (78)	English (67)[5] Afrikaans (7) isiXhosa (6)	English	7000

One of the clear differences between the schools is the language the learners speak at home. In Xolani, the great majority of the learners speak isiXhosa. They are taught in isiXhosa the first three years of school, but in grade 4 the teachers are expected to shift to English even though many of the lessons are conducted in isiXhosa or at least by code switching between isiXhosa and English. Acadia has learners from all the three main language groups, but the majority are Afrikaans HL speakers, and the school has been predominantly Afrikaans speaking. However, two of the three seventh-grade classes are now English medium classes whereas one uses Afrikaans as LoLT. Eaglewood is a mixed school with learners from all the language groups. Most of the learners come from townships or settlements in the neighbourhood and speak isiXhosa or

English at home. There are also several Afrikaans-speaking learners in Eaglewood. The LoLT in Eaglewood is English from grade 1. In Freewill, however, the learners mostly speak English at home, and the LoLT is English. Freewill's location in an affluent area of Cape Town indicates the more advantageous background of the learners compared to the learners in the three disadvantaged schools.

Instrument

Four semi-structured interview guides were used during the interview sessions with (a) learners, (b) teachers, (c) principals and (c) others. The group of others included WCED officials and educational specialists. The learners' interview guide was structured thematically around inside school access and outside school access with subsequent questions. Additionally, themes such as LoLT, learners' HL and learners' attitudes towards ICT in general were brought up. The interview guides for teachers, principals and others also included questions on ICT implementation, policy framework and other contextual factors.

Part of the questionnaire was adapted from a series of studies on school computer culture conducted in Iceland from 1998 to 2008 (Jakobsdottir 2008). These provided the fundaments in constructing a questionnaire fitted to the context in Cape Town. The questionnaire was piloted in two schools in Cape Town. After the pilot study, the questionnaire was further modified in order to fit the local context and the research focus. This included reducing the use of questions with answers on a Likert scale and further simplifying the language and structure. It was also considered necessary that the questionnaires would be available in the three main languages of the learners, English, Afrikaans and isiXhosa, so that the learners themselves could choose the language they found easiest to respond in and to do justice to the different languages. The translations were done with the help of local experts and researchers from the University of the Western Cape in Cape Town.

One particular question on the questionnaire will be reported here together with a question on HL and home access of learners. The question reads as follows: 'Here is a list of things people sometimes do on a computer. Please tick off those that you already know how to do'. A list of 14 skills followed. The skills are categorised as shown in Table 2.

Table 2: Overview of skills

Categories	Skills
Information finding and retrieval:	Seek information on the internet Seek information on a CD-ROM Copy from the internet Copy/download music from the internet
Online communication:	Chat Blog
Creativity/presentation:	Design web pages Draw/design Make presentations Write text
Analytical skills/programming:	Programming software Use data calculations
Play/games:	Play computer games Play internet games

As the seventh-grade learners had used computers for several years at school, questions concerning basic skills and file management (such as opening, saving, deleting and printing documents or installing software) were intentionally not included in the questionnaire. The classroom observations, however, revealed that some of the learners had limited command of the most basic applications. If these basic skills had been included in the list of skills, the mean number of skills learners reported would have been higher.

Procedure

The fieldwork started with classroom observations in order to become acquainted with the learners and teachers as well as the "computer culture" in the schools (Gudmundsdottir & Jakobsdottir 2009). Each of the three disadvantaged schools (Acadia, Eaglewood and Xolani) was visited one to two times a week during the seventh-graders' computer sessions[6] in the computer lab. Freewill participated only in the quantitative part of the study; thus, the learners and teachers were not formally interviewed or observed. During the observations, field notes were taken focusing primarily on learners' skills and use of the computers but also on the language issue in the classroom as well as teacher learner interaction and interaction between the learners themselves.

After observations had been conducted in Acadia, Eaglewood and Xolani's computer rooms for nine weeks, the learners were asked to fill in a close-ended questionnaire. In total, 290 seventh graders answered the questionnaire on their use of computers within and outside of school. There were also questions regarding learners' language background and attitudes connected to computer use. It was important that the questionnaire reach the majority of learners in order to get a broad overview of the skills and access inside and outside of school. In Freewill, the learners answered the questionnaire at the end of the fieldwork period as they participated only in the latter part of the fieldwork. The majority of learners were included in the quantitative part of the study to better grasp the great complexity of the learners' background, which was difficult to cover in the smaller sample of interviewed learners.

The interviews with the principals in the disadvantaged schools started shortly after the fieldwork started, and each one was interviewed several times formally (including audio-recorded interview sessions) and informally. The class teachers for grade 7 and the teachers assigned responsibility for the computer room were interviewed in order to verify the findings from the observations and to cross check if their views on ICT use in the classroom coincided with the learners' views. The seventh-grade teachers were interviewed at their convenience during the latter part of the fieldwork mostly after school hours. The learners were also interviewed in the latter part of the fieldwork partly to address some of the preliminary findings from the questionnaire. Whereas the formal interviews were all audio-taped and transcribed, informal conversations with teachers, other staff at the schools and educational specialists also took place and were used to triangulate the findings from the formal interview sessions. The learners were interviewed in pairs in order to make the interview situation less intimidating for them. The arrangement worked well and enabled communication, but made the transcribing process more complicated.

The interviews were conducted in English and in isiXhosa. The Afrikaans-speaking learners in Acadia and the isiXhosa learners in Acadia, Eaglewood and Freewill were interviewed in English. The questionnaires were, however, available in all three languages. As a result of the experiences during the initial observations and possible language barriers, an isiXhosa-speaking interpreter was present during all the learners' interviews in Xolani. The interpreter helped translate the questions and learners' answers when necessary. In order to verify the translations, a professional isiXhosa-speaking translator transcribed the interviews from the audiotapes. The

interviews lasted from 20 minutes up to two hours. The learners' interviews were typically shorter than the interviews with the teachers.

Ethical considerations

Research clearance was granted by the Western Cape Education Department (WCED) and the management of the Khanya project[7] in the summer of 2006. The principals permitted the research in their schools, and a parental consent form was sent out from the principal's office in the three focal schools where formal interviews and observations were conducted. The learners could withdraw at any time from participating in the research. After the learners had been randomly selected to participate in the interviews, the learners were told that their participation was on a voluntary basis. All of the learners indicated that they were willing to continue their participation, and all the learners present on the days when the survey was conducted participated.

Data analysis

The qualitative data (observations, interviews and field notes) were analyzed within NVivo 8. Initially the data were explored to identify and index thematic content and emerging categories, including issues regarding teachers, school leadership, students use, language issues and support. These were further divided into more precisely defined sub-themes. A cross-case analysis was conducted to identify differences and similarities between schools, language groups, HL and gender. The quantitative data were analyzed in SPSS v.16.0 using descriptive statistics, including frequencies, means, percentages and standard deviation. Learners' skill level was estimated from the mean number of ICT skills each student had reported. Learners who had reported 0 to 3 skills were grouped and set at level 1, those who had indicated 4 to 8 skills at level 2 and at level 3 if they had indicated 9 or more skills. Chi-square and analysis of variance (ANOVA) values were examined to test for significant differences between means of skills and variance between groups. A post-hoc Games-Howell test, which is recommended when the group sizes vary, was used to do multiple comparisons.

RESULTS

In this section, an overview will be given presenting the learners' self-reported skills as well as skill level. The data presentation is primarily based on the quantitative data. Then a discussion follows on specific internal and external factors that affected learners' opportunities and capabilities to raise their ICT competence and skills. This discussion draws examples from the qualitative and quantitative data.

Self-reported skills

Thirty-one percent (31%) of the learners were categorised as being on level 1, 40% of the learners were on level 2 and 29% of the learners were on level 3. The mean number of skills for all the learners (N = 290) is 6.10 (SD = 3.68). A (4x2) ANOVA revealed significant differences by school ($F(3,280)$ = 63.34, $p < 0.001$) in the mean number of ICT skills, but there were no clear gender differences. Furthermore, the difference in home access by gender was not significant, which indicates that girls and boys in the study have equal access to computers outside of school. The mean number of skills reported by the girls is 5.76 (SD = 3.57), and the mean number of skills reported by boys is slightly higher, but not significantly higher, at 6.47 (SD = 3.79). The only gender difference mentioned in the interview data was by teachers in Acadia, who

talked about the girls in general as more motivated in school. The learners themselves did not address the issue of gender in connection with ICT skills and use.

When the quantitative data were examined, the range of ICT skills reported in the four schools of the study was wide. The learners in the previously white school, Freewill, reported the highest mean number of skills. The learners in the previously white school, Freewill, reported the highest mean number of skills, M = 9.15 (SD = 3.12). These learners were followed by the Eaglewood learners, who reported a mean number of skills of 7.8 (SD = 2.40). The learners in Acadia reported a mean number of skills of 5.78 (SD = 3.41), and the Xolani learners reported a mean number of skills of 3.10 (SD = 1.91). Even though the ANOVA calculations revealed a general significant difference by school, a post-hoc Games-Howell test was conducted to determine whether the difference between the schools was significant. The mean difference between Acadia and Eaglewood was 2.03 (p = .003), between Acadia and Xolani the mean difference was 2.68 (p = .000) and between Acadia and Freewill, the mean difference was 3.38 (p = .000). When the difference between Xolani and Eaglewood was explored, the post-hoc test revealed a mean difference of 4.71 (p = .000) and between Xolani and Freewill the mean difference was 6.06 (p = .000). Finally, the mean difference between Eaglewood and Freewill was 1.35 (p = .083). The post-hoc test results reveal a significant difference between the schools, except between Eaglewood and Freewill, the two schools with the highest mean number of skills.

In the interviews, the learners from Eaglewood reflected to a greater extent on their computer use and the role of ICT in learning and everyday life and work. Their understanding and attitudes towards ICT were, in other words, more complex even though the majority of the learners in Acadia and in Xolani were also greatly enthusiastic about ICT and computers in general. A difference between the schools in the qualitative data occurred, for example, when learners were asked to reflect on the difference between lessons in the computer room versus lessons in the classroom as well as when asked a question on the role of ICT and why learning to use computers was important.

Looking further at individual skills, Table 3 gives an overview of the percentage of learners who answered they already knew each of the skills. The first column reports all seventh graders in all the schools whereas the next columns show the percentage of seventh graders within each school that reported each skill. Most of the learners, or 74%, indicated that they knew how to play computer games. In addition, the great majority, or 71%, of the learners indicated that they knew how to write a text, 58% knew how to play internet games and 54% how to use different drawing or design programmes. The smallest proportion of learners reported that online communication such as blogging (21%) and software programming (20%) were skills they already had. As the skills listed in question 11 are not exhaustive, the learners were also given the opportunity to add skills that they could define themselves to the list. A few of the learners used that opportunity (*n* = 19, or 6.6%). However, they mostly revealed basic skills (such as downloading, copying or making folders), which had already been excluded from the list. A few other skills were mentioned that were easily categorised within the existing categories (such as copying films and using chat programmes).

Looking at each of the schools reveals a slight variance between the skills reported in each school. Interestingly, the majority of Xolani learners reported they know how to perform data calculations on the computer. This may be connected to the frequent use of the CAMI maths software, one of few programmes available for the learners and teachers in Xolani.

Table 3: Percentage of learners knowing certain skills

Percentage of all 7th gr. learners answering they already know how to:		Within 7th. gr. Acadia in %	Within 7th gr. Eaglewood in %	Within 7th gr. Freewill in %	Within 7th gr. Xolani in %
Play computer games	74	86	97	96	33
Write text	71	53	97	82	70
Play internet games	58	72	84	82	12
Draw/design	54	53	84	74	26
Seek information on the internet	51	50	74	90	9
Copy material (text, pictures) from the internet	50	45	74	85	15
Copy/download music from internet	45	49	36	76	17
Use data calculations	45	19	77	28	76
Chat on the internet	37	43	13	64	14
Seek information on a CD	34	36	26	56	15
Design web pages	28	18	42	63	3
Make presentations/overheads	22	20	61	44	1
Blog on the internet	21	22	3	40	9
Programming software	20	20	13	36	9

School factors

Possible indications of the disparity in computer use and in the skill level of learners in the disadvantaged schools were revealed when location, class size and LoLT were compared between the schools (see Table 1). Additionally, the qualitative data revealed, for example, a clear difference in the teaching methods and views of the teachers when using the computer room. In Eaglewood and Freewill, the methods used were learner centred whereas in Acadia and Xolani they tended to be more teacher centred. In Freewill, the majority of lessons in the computer room were conducted by a specially assigned computer teacher who had formal computer training from pre- and in-service courses. The computer teacher in Eaglewood had also taken a one-year full-time diploma course in computer-assisted education at the University of Pretoria. According to the principals in Xolani, Acadia and Eaglewood, the majority of the teachers had no formal training in the use of ICT, apart from the initial training module provided by the Khanya initiative. This training module varied from school to school in length and duration (cf. Gudmundsdottir 2010). According to several of the teachers, this training had not focused on the pedagogical use of computers with learners but rather focused on basic computer literacy in order to reach the majority of the teachers[8]. As one of the teachers in Acadia said:

> *some of them [the teachers] had no contact with computers at all. It was a brand-new thing. So when Khanya came here, some of the more mature teachers at the school felt a bit intimidated by the technology… so we took it [the training component] on a base or level were everybody is brand new to this thing, so we started from that side (Pieter, interview 180507).*

Indeed, some of the teachers did not feel at ease with the technology. In Xolani, there were problems getting the teachers to use the computer room with their classes, and as Menzi and

several other teachers mentioned, the teachers lacked support and help in knowing which software to use in a particular learning context.

> *We've found out that when the class is supposed to be here at a certain time, it is a challenge because they don't come. The teachers are not interested. They are not computer literate, the teachers. If maybe they can be provided with some computer courses. Maybe the teachers should know that this is the programme that will assist you with this and that. (Menzi, interview 230507).*

The teachers in the disadvantaged schools were new to the technology and may therefore need extra support to start using computers with their learners. In Acadia, repetitive use of two particular computer programmes was apparent. These programmes were the ones the teachers got special training in using with their classes, and the teachers rarely used other programmes during computer sessions with their classes. Jacobus, a teacher in Acadia, said that they did not know how to use all the programmes, whereas his colleague Pieter in the same school explained that the reason for not using more programmes was lack of time.

Both Eaglewood and Freewill prioritised having a designated computer teacher who served as a computer teacher for the learners and as a supportive colleague for the other teachers when they needed assistance. Even though the teachers in Eaglewood claimed they got a lot of support, William still admitted that his personal wish would be to:

> *get more time…or if it is a form of a manual or whatever guide, a training manual or something where I could read and be in the computer room and continue with it and explore all the various possibilities (William 220507).*

On a similar note, Sophia, also a teacher in Eaglewood, says that she thinks:

> *Every school should have a teacher dedicated to teaching [computers] like we have. Because to me it should be treated the same as art or dance but of course integrated… but everybody does not have, what I noticed from the teachers, the confidence, the time, the patience (Sophia 220507).*

The teachers in Acadia and Xolani did not have support from a computer teacher in the computer room. This was partly due to lack of resources as a special computer teacher had to be taken off the limited teaching resources each school had. The teachers in Acadia and Xolani could therefore ask colleagues for help during breaks or after school hours. This may explain that on occasion teachers did not show up with classes in the computer room even though it was their "turn" on the timetable. This was particularly noticeable in Xolani where the computer room was not in use on several occasions during the observation period.

In a school where many of the learners do not have access to computers outside of school and many of the teachers have not used the technology before, access to support matters a great deal. In Eaglewood, the principal was eager to give the learners the opportunity to learn how to use ICT, and he emphasised the use of ICT at all levels in school. He encouraged the teachers and administrative staff as well as the learners to practise their computer skills. The principal and the computer teacher had established a popular computer club for the learners (extracurricular activity), and the teacher had also given computer courses for the staff and the parental community. In Freewill, the parental community supported and provided some of the equipment in the computer room and were actively involved in the computerisation in school. Even though the principals in both Xolani and Acadia recognised the importance of ICT use and supported its use in school, they were not as actively involved in supporting ICT use as the principal in Eaglewood.

Even though one of the points made earlier in this paper is not to focus on pure material access alone, it is clear that the frequency of use and time spent in the computer room plays a role not only for the skills of the learners but also for the teachers. The access to support and adequate training possibilities is likewise of great importance. Some of the internal factors have now been considered and their possible influences on the digital divide. Following is an exploration of external factors which influence the use of ICT within the school environment.

External factors

Exploring external factors puts a focus on the role of home access to computers and the internet in learners' self-reported skills. Of the 287 learners answering question 5 on home access to computers and Internet, 148 learners, or 52%, answered that they had access to a computer at home, whereas 139, or 48%, indicated no access. In following up these numbers in the interviews with the learners, several of the interviewed learners (and teachers) claimed that the computers they had access to at home were either broken or not working properly. The strong desirability to own a personal computer may have resulted in a somewhat skewed answer to this question.

Furthermore, a chi-square test revealed that there were significant differences by school in computer and internet access, χ^2 (3, $N = 287$) = 90.59, $p < .001$ and χ^2 (3, $N = 277$) = 86.69, $p < .001$, respectively. The learners in the disadvantaged schools were less likely to have computer and internet access at home than the learners in Freewill (see further Gudmundsdottir & Jakobsdottir 2009). Similarly, a chi-square test also revealed that there were significant differences by home access and skill level, χ^2 (2, $N = 287$) = 41.20, $p < 0.001$). The skill level tended to be higher for learners with access to computers at home.

Figure *1* shows how ICT skill level differed by learners' access to computer at home. Almost half of the learners (46%) who do not have access to a computer at home (black columns) are represented in the lowest skill group, i.e. at level 1, while 43% of the ones who have access to a computer at home (grey columns) are categorised in the level 3 group. Around 40% of the learners with and without access to computers at home are however categorised in the level 2 group.
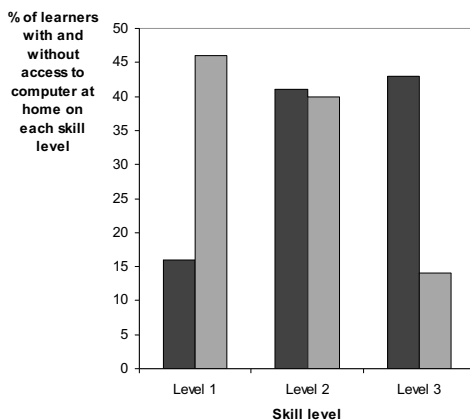
Figure 1: Computer at home by skill group (with access = black, without access = grey)

For the learners who had replied that they had access to computer at home, the reported mean number of skills was 7.50 (SD = 3.68) whereas the learners who did not have access at home reported a mean number of skills of 4.62 (SD = 2.99). The majority of the learners in Freewill (83.3%) reported home access to computers, and 70.1% have access to an internet-connected computer. In contrast, only 13% of the learners in Xolani have access to a computer at home, and less than half of these, or 4.8%, have access to an internet-connected computer (see Table 4).

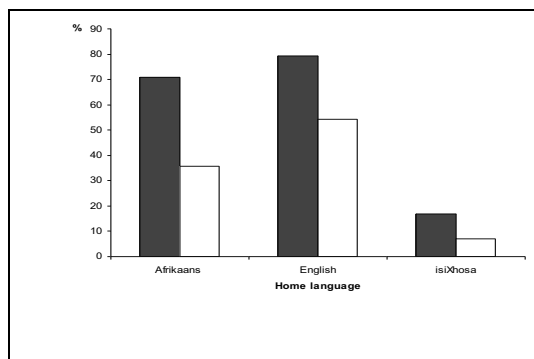**Table 4**: *Access to computers and the internet by school and by home language*

School	Percentage of learners having **computer** access at home (N = 287)		Percentage of learners having **internet** access at home (N = 277)	
	n	%	n	%
Acadia	60	64.5	22	25.6
Eaglewood	12	38.7	5	16.7
Freewill	65	83.3	54	70.1
Xolani	11	12.9	4	4.8

These findings were also supported in the qualitative interviews conducted with learners and teachers. The majority mentioned different skill levels of learners in their class. When asked about a possible explanation for this, the answer was often that those with computers at home were better than the others. Vanessa (030507), a learner in Acadia, answered when asked about her classmates, that some were very good when it came to using computers and continued:

> *I think not just because they have computers at home, they know about it, they do things on their computer; the programmes that they have at home are not the same at school. If they can go on the internet, they also know more sites than the others.*

All of the participants in this study specified one language as their HL. Most of the learners spoke isiXhosa (40%) and English (39%) whereas 17% of the participants reported that Afrikaans was their HL. The majority of the learners in Acadia still had Afrikaans-speaking parents who spoke Afrikaans to each other but spoke English to their children. Many of these children reported English as their HL despite coming from traditionally Afrikaans-speaking families and culture. This may have resulted in fewer learners stating Afrikaans as their HL. A few learners (*n* = 15) reported an HL other than these three and were not included in the analysis connected to HL. Xolani was the only school with only isiXhosa-speaking learners[9] whereas in the other three schools all the three language groups were represented in the learner population.

The isiXhosa-speaking learners had less access to computers at home (16.8%) than the two other main language groups in which more than 70% had access at home (see Figure 2). The English-speaking learners had the best access to computers and the internet at home, but the Afrikaans-speaking learners also had the most access at home with more than 70% answering that they had access to a computer and more than 35% had access to the internet. The isiXhosa-speaking learners also had the least access to Internet at home or 7%.

Figure 2: *Home access to computers and the internet according to language groups (access to computers = black columns, access to internet = white columns)*

Learners with English as their HL reported a mean number skills of 8.38 (SD = 3.12), Afrikaans HL learners reported a mean number of skills of 5.90 (SD = 3.12) and isiXhosa learners reported a mean number of skills of 4.03 (SD = 2.74). The majority of the English HL learners were either on level 2 or on level 3, whereas more than half of the isiXhosa HL learners were on level 1. The majority of the Afrikaans HL learners (58%) were categorised in the level 2 skill group. A chi-square test examining the relationship between learners' HL and their self-reported ICT skills shows a statistically significant relationship between the two variables χ^2 (4, N = 275) = 75.87, $p <$ .001. Additionally the isiXhosa HL learners at Freewill, Eaglewood and Acadia reported more skills than the isiXhosa HL learners at Xolani. The Afrikaans HL learners are particularly well skilled at Freewill and have the highest means in the study (M = 10) when looking at each HL group within each school, but in Eaglewood, the Afrikaans learners report fewer skills (M = 6.50) than their isiXhosa-speaking classmates from the same school (M = 7.44). In Acadia, the English HL learners report slightly higher skills (M = 6.23) than the Afrikaans HL learners (M = 5.7) and isiXhosa HL learners (M = 5.4).

Summary of findings

Months of observation of computer sessions in the disadvantaged schools clearly showed that learners' ICT use and skill level varied greatly by school. Numerous earlier studies have revealed gender differences in ICT use and skills. However, the results from this study showed no gender differences. This finding may possibly be explained by the relatively limited home computer use by the participants (by both girls and boys) and/or the possible equalising effect of school use where every learner had access regardless of gender.

Factors within and outside of school influence learners' use and skills of ICT and thereby affect the digital divide between the schools. Home access and HL as well as teachers' competence and access to support play a crucial role. The difference in learner's skill level by school varies, indicating the importance of viewing the influence of the school environment more broadly than from a few selected factors such as number of computers, gender or ethnicity composition. The learners in Eaglewood who mostly live in townships are well skilled and do better than the other disadvantaged learners in the study. The difference in mean number of skills between the Eaglewood learners and the learners in Freewill is not significant. These learners do indicate a

higher skill level than the learners in Acadia and in Xolani. The Afrikaans HL learners do better in Freewill than they do in Acadia or Xolani, which supports the influence of the school rather than the influence of HL on its own. It should however be kept in mind that learners in Freewill are generally much better off than the learners attending Xolani or Acadia. The learners in Xolani who have the least access at home and the least support at school report fewer skills than the learners from the other schools. The language aspect is indeed important as especially the learners speaking isiXhosa are further disadvantaged in a classroom teaching in English with English teaching materials. In that respect, it can be argued that the holistic approach in Eaglewood, including support, after-school activities, connection with the parental community, teacher training, size and motivated and visionary leaders, compensates for learners' lack of access outside of school and serves as a stimulus and encouragement for the learners that do not have English as their HL.

DISCUSSION

One of the limitations of this study is the focus on skills as representative of the digital divide as "skill access" is only one aspect of the digital divide according to different definitions (van Dijk & Hacker 2003; Warschauer 2004). Skill level can indeed indicate learners' competence of using computers, but to address this limitation, the skill level of learners was related to other factors within and outside of school and viewed in connection with the capabilities of teachers and the learners' home background and access to computers and the internet. In that way, the approach became more inclusive and strengthened the validity of the results. The findings should, however, be seen only as an indication of a possible divide and/or lack of equity as all possible aspects influencing the digital divide have not been covered. In addition, comparing the participating schools is complicated in terms of methodology due to the different compositions with regard to size, learner population, LoLT, HL, teaching methods and so on. In addition, there is a certain selection bias when it came to deciding which schools were included in the study. Thus, the findings are not meant to generalise to all schools in Cape Town but can serve as an indicator of some of the factors influencing equity in access to and learners' skill level and use of ICT.

The differences in ICT skills reported here are affected by learners' opportunities outside of school to access and use computers. Raising the ICT competence of the learners needs to be addressed in a comprehensive way, which means that merely implementing ICT in the classrooms is not adequate for reaching greater digital equity. More attention to supporting teachers in the disadvantaged schools, especially those that do not have access and opportunities outside of school to practise and prepare their lessons, should be given. This may be done by providing regular in-service training. Moreover, the vast differences in learners' access and use outside of school are highly connected to wider social inequalities within society. Therefore, in order to achieve greater equity and access for all, the strategies and ways of implementing ICT in particular in disadvantaged schools are of immense importance.

The main aim of the Ministry of Communication in South Africa as presented in a green paper in 2000 is to increase digital literacy and provide everyone in South Africa with basic digital literacy skills (SADoC 2000). This study indicates that socio-economic differences, location and language affect learners' opportunities and freedom to use ICT within and outside of school. In fact, this also corresponds to the findings of the study on digital divide in South Africa by Langa et al. which found that it reflected "wider social inequalities in the country" (2006, p.145). Furthermore, when Czerniewicz refers to the history of South Africa, she argues that in 1994 a new South Africa was born, great optimism and hope were characteristic of the country and:

> *many people anticipated that new policies and firm measures of redress would contribute to the creation of a more equitable and fair society, and enable South Africa to become a player in the global community (Czerniewicz 2004, p.145).*

Considerable efforts have been made by educational authorities to create a holistic ICT policy. However, the policy focus needs to shift to include local realities of the learners within and outside of school in order to reach greater digital equity. The digital divide has been addressed in terms of gaining material access and by that increasing equality in access instead of addressing equity of use and providing disadvantaged learners better surroundings at school and in their community/home environment to be able to utilise ICT. School leaders, administrators and educational policy-makers have a special responsibility to equalise computer use by making ICT meaningful and empowering for all societal groups. As Sen (1992, p. 2) argues: "equality in terms of one variable [access to ICT in this case] may not coincide with equality in the scale of another" [skill level]. Therefore, it may sometimes be necessary to use unequal means or treatment to reach greater equity. Sutton claims:

> *if schools wish to provide equity for poor children with respect to their confidence and competence concerning computer learning, poor children need to be provided more in-school access—that is, inequality of access (Sutton 1991, p.477).*

Using unequal means of access within schools may be one alternative since learners' capability of using ICT outside of school is limited. Sen's "functionings", which more reflect the living conditions and external environment of the learners and can thus be connected to equality in access, are important when raising learners' capability of using ICT. Learners' capability is, however, connected to the notion of freedom and justice and real opportunities they have, i.e. with regard to equity. It is therefore important to address the concept of digital divide more holistically, with equality perspectives and a focus on learners' equity within and outside of school.

Finally, the findings of this study indicate some of the advantages of the English-speaking learners in relation to using ICT, which is English dominated. This applies to learners with English as a HL as well as learners attending English medium schools. One of the possible explanations is the lack of availability of platforms, software and online materials in the other languages, in particular for the isiXhosa-speaking learners but also for the Afrikaans-speaking learners (Gudmundsdottir 2010). This suggestion does, however, not indicate that all learners should be taught all subjects in English. Rather, increased focus should be placed on adapting ICT to the local curriculum, local needs and the linguistic environment of the users. LoLT is an ongoing debate in South Africa and, in relation to use of ICT, is an intriguing topic in need of further research.

Future research could also contribute to understanding the importance of teachers' support and training as they influence meaningful integration of ICT. Indeed, there is a great challenge of building up expertise, and adapting technology to developing countries, particularly the socio-cultural, economic and political environments. At the same time, the importance of an indigenous initiative and the ability to establish, sustain and develop ICT cannot be underestimated and should be included in future inquiries. Based on the findings of this study, the final point to be made is related to the importance of emphasising that future educational reform and policy initiatives need to fully acknowledge the different conditions and realities of learners. As Maldonado, Pogrebnyakov and van Gorp state:

> *the concepts of digital divide and social exclusion are highly interwoven, specifically addressing the multiple dimensions of social exclusion and how they are both a cause*

and consequence of the digital divide is of prime importance (Maldonado, Pogrebnyakov & van Gorp 2006, p.149).

Having a one-size-fits-all policy is bound to have limitations in a country like South Africa where the school realities for learners are so diverse.

ACKNOWLEDGEMENTS

REFERENCES

Alampay, E. 2006, "Beyond access to ICTs: Measuring capabilities in the information society", *International Journal of Education and Development using ICT*, vol. 2, no. 3, pp. 4-23.

Attewell, P. & Battle, J. 1999, "Home computers and school performance", *The Information Society*, vol. 15, no. 1, pp. 1-10.

Banerjee, S., Kang, H., Bagchi-Sen, S., & Rao, H.R. 2005, "Gender divide in the use of the Internet applications", *International Journal of E-Business Research*, vol. 1, no. 2, pp. 24-39.

Bloch, G. 2009. *The Toxic Mix. What's Wrong with South Africa's Schools and How to Fix It*, Tafelberg, Cape Town.

Chen, W. & Wellman, B. 2004, "The global digital divide - within and between countries", *IT & Society*, vol. 1, no. 7, pp. 39-45.

Chigona, W., Mbhele, F., & Kabanda, S. 2008. *Investigating the Impact of Internet in Eliminating Social Exclusion: The Case of South Africa*, IEEE, New York.

Chisholm, L. (ed.) 2004. *Changing Class. Education and social change in post-apartheid South Africa*, Human Sciences Research Council Press, Cape Town.

Compaine, B.M. 2001. *The Digital Divide: Facing a Crisis or Creating a Myth?*, The MIT Press, Cambridge MA.

Cotten, S., Anderson, W., & Tufekci, Z. 2009, "Old wine in a new technology, or a different type of digital divide?", *New Media & Society*, vol. 11, no. 7, pp. 1163-1186.

Creswell, J.W. 2009. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd edn, Sage Publications, Thousand Oaks CA.

Cuban, L. 2001. *Oversold and Underused: Computers in the Classroom*, Harvard University Press, Cambridge MA.

Czerniewicz, L. 2004, "Cape of Storms or Cape of Good Hope? Educational technology in a changing environment", *British Journal of Educational Technology*, vol. 35, no. 2, pp. 145-158.

Department of Education 2004a. *National Education Information Policy*, Department of Education, Pretoria.

Department of Education 2004b. "Whitepaper on e-education. Transforming learning and teaching through Information and Communication Technologies (ICTs)", Retrieved on October 10, 2008 from http://www.capegateway.gov.za/eng/publications/ white_papers/2004/93586.

DiMaggio, P., Hargittai, E., Celeste, C., & Shafer, S. 2004, "From unequal access to differentiated use: A literature review and agenda for research on digital inequality", *Social Inequality. Working paper series*, no. 15, Retrieved on June 24, 2010 from http://www.webuse.org/digital-inequality-from-unequal-access-to-differentiated-use/index.html.

DISE 2010, "DISE 2009-2010 data collection", National University of Educational Planning and Administration, Retrieved on February 4, 2010 from http://www.dise.in//.

European Union 2006, "Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning", Retrieved on December 30 2008 from http://eur-lex.europa.eu/LexUriServ/ LexUriServ.do?uri=OJ:L:2006:394:0010:0018:EN:PDF.

Fiske, E.B. & Ladd, H.F. 2004. *Elusive Equity. Education Reform in Post-Apartheid South Africa*, Brookings Institution Press, Washington DC.

Gudmundsdottir, G.B. 2010, "When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language", *Information Technology for Development*, vol. 16, no. 3, pp. 174-190.

Gudmundsdottir, G.B. & Brock-Utne, B. 2010, "An exploration of the importance of piloting and access as action research", *Journal of Educational Action Research*, vol. 18, no. 3, pp. 359-372.

Gudmundsdottir, G.B. & Jakobsdottir, S. 2009, "A digital divide: Challenges and opportunities for learners and schools on each side", in H. Holmarsdottir & M. O'Dowd (eds.), *Nordic Voices*, Sense Publishers, Rotterdam, pp. 173-201.

Hole in the Wall 2010, "Technological innovations", Hiwel, Retrieved on February 4, 2010 from http://www.hole-in-the-wall.com/technological-innovations.html.

Jackson, L.A., Zhao, Y., Kolenic, A., Fitzgerald, H.E., Harold, R., & Von Eye, A. 2008, "Race, gender and information technology use: The new digital divide", *Cyberpsychology & Behavior*, vol. 11, no. 4, pp. 437-442.

Jakobsdottir, S. 1996, "Elementary School Computer Culture: Gender and Age Differences in Student Reactions to Computer Use", The University of Minnesota, Minnesota.

Jakobsdottir, S. 1999, "Tölvumenning íslenskra skóla: kynja- og aldursmunur nemenda í tölvutengdri færni, viðhorfum og notkun (Translated: Computer culture in Icelandic schools: gender and age differences in students' computer use, skills, and attitudes)", *Uppeldi og menntun*, vol. 8, pp. 119-140.

Jakobsdottir, S. 2008, "School computer culture: Ongoing series of studies on computer use of Icelandic children and adolescents, their computer-related attitudes and skills*"*, Retrieved on January 11, 2009 from http://soljak.khi.is/computerculture/.

Langa, Z., Conradie, P., & Roberts, B. 2006, "Slipping through the Net: Digital and other communication divides within South Africa", in U. Pillay, B. Roberts & S. Rule (eds.), *South African Social Attitudes. Changing Times, Diverse Voices*, Human Sciences Resource Council (HSRC), Cape Town, pp. 131-149.

Liu, Y., Cornish, A., & Clegg, J. 2007, "ICT and special educational needs: Using meta-synthesis for bridging the multifaceted divide", in Y. Shi, J. Dongarra, G.D. VanAlbada, & P.M.A. Sloot (eds.), *Computational Science - ICCS 2007, Pt 4, Proceedings*, vol. 4490, Springer-Verlag Berlin, Berlin, pp. 18-25.

Maldonado, E.A., Pogrebnyakov, N.A., & van Gorp, A.F. 2006, "ICT policies as a means to inhibit social exclusion: The South African case", in E.M. Trauth, D. Howcroft, T. Butler, B. Fitzgerald & J.I. DeGross (eds.), *Social Inclusion: Societal and Organizational Implications for Information Systems*, vol. 208, Springer, New York, pp. 137-150.

Miller, L., Naidoo, M., & Van Belle, J.P. 2006, "Critical success factors for ICT interventions in Western Cape schools", *36th Annual Conference of the Southern African Computer Lecturers Association*, J.-P.V. Belle & I. Brown (eds), University of Cape Town, Sommerset West, Retrieved on March 3, 2010 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.122.1095&rep=rep1&type=pdf#page=100.

Norris, P. 2001. *Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide*, Cambridge University Press, Cambridge.

Nsibirano, R. 2009, "'Him and Her' - Gender differentials in ICT uptake: A critical literature review and research agenda", *International Journal of Education and Development using ICT*, vol. 5, no. 5, Retrieved on January 18, 2010 from http://ijedict.dec.uwi.edu/viewarticle.php?id=858&layout=html.

One laptop per child 2010, *Press releases*, Retrieved February 4, 2010 from http://laptop.org/en/utility/press/index.shtml.

Robeyns, I. 2005, "The capability approach: a theoretical survey", *Journal of Human Development*, vol. 6, no. 1, pp. 93-117.

SADoC 2000. *Green Paper on Electronic Commerce fro South Africa*, South African Department of Communications, Pretoria.

Sanders, J. 2006, "Gender and technology in education: A research review", *Handbook of Gender in Education.* Sage Publications, *London*, vol. 19, p. 2007, Retrieved on January 18, 2010 from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.90.8685&rep=rep1&type=pdf.

Sayed, Y. 1998. *The Segregated Information Highway: Information Literacy in Higher Education*, University of Cape Town Press, Cape Town.

Selwyn, N. 1998, "The effect of using a home computer on students' educational use of IT", *Computers and Education*, vol. 31, no. 2, pp. 211-227.

Sen, A. 1992. *Inequality Reexamined*, Oxford University Press, Oxford.

Sen, A. 1997, "Human capital and human capability", *World Development*, vol. 25, no. 12, pp. 1959-1961.

Sen, A., Hawthorn, G. & Muellbauer, J. 1988. *The Standard of Living*, Cambridge University Press, Cambridge.

Soudien, C. 2004, "'Constituting the class': an analysis of the process of 'integration' in South African schools", in L. Chisholm (ed.), *Changing Class: Education and Social Change in Post-apartheid South Africa*, HSRC Press, Cape Town, pp. 89-114.

Stevenson, O. 2008, "Ubiquitious presence, partial use: the everyday interaction of children and families with ICT", *Technology, Pedagogy and Education*, vol. 17, no. 2, pp. 115-130.

Sutton, R.E. 1991, "Equity and computers in the schools: A decade of research", *Review of Educational Research*, vol. 61, pp. 475-503.

Thomas, J.J. & Parayil, G. 2008, "Bridging the social and digital divides in Andhra Pradesh and Kerala: A capabilities approach", *Development and Change*, vol. 39, no. 3, pp. 409-435.

UNESCO 2010, *Media and Information Literacy*, Retrieved on July 15, 2010 from http://portal.unesco.org/ci/en/ev.php-URL_ID=15886&URL_DO=DO_TOPIC&URL_SECTION=201.html.

van Dijk, J. & Hacker, K. 2003, "The digital divide as a complex and dynamic phenomenon", *The Information Society*, vol. 19, no. 4, pp. 315-326.

van Dijk, J. & van Deursen, A. 2009, "Inequalities of Digital Skills and How to Overcome Them", in E. Ferro, Y.K. Dwivedi, J.R. Gil-Garcia & M.D.Williams (eds.), *Handbook of Research on Overcoming Digital Divides: Constructing an Equitable and Competitive Information Society*, IGI Global, Hershey PA, pp. 278-291.

van Dijk, J.A.G.M. 2005. *The Deepening Divide. Inequality in the Information Society*, Sage, Thousand Oaks CA.

van Dijk, J.A.G.M. 2006, "Digital divide research, achievements and shortcomings", *Poetics*, vol. 34, no. 4-5, pp. 221-235.

Volman, M., van Eck, E., Heemskerk, I. & Kuiper, E. 2005, "New technologies, new differences. Gender and ethnic differences in pupils' use of ICT in primary and secondary education", *Computers & Education*, vol. 45, no. 1, pp. 35-55.

Warschauer, M. 2004. *Technology and Social Inclusion: Rethinking the Digital Divide*, MIT Press, Cambridge MA.

Warschauer, M. & Matuchniak, T. 2010, "New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes", *Review of Research in Education*, vol. 34, no. 1, pp. 179-225.

Western Cape Education Department 2003, *Information and Communication Technologies (ICT) in WCED schools*, http://wced.wcape.gov.za/home/projects/school_it.html.

Wresch, W. 2009, "Progress on the global digital divide: an ethical perspective based on Amartya Sen's capabilities model", *Ethics and Information Technology*, vol. 11, no. 4, pp. 255-263.

Zheng, Y. 2009, "Different spaces for e-development: What can we learn from the capability approach?", *Information Technology for Development*, vol. 15, no. 2, pp. 66-82.

ENDNOTES

[1] *Previously disadvantaged* applies to the black and coloured population of South Africa. It is somewhat misleading to call these learners *previously* disadvantaged as they are in general in a worse economic and social situation than the so-called previously ex-Model C school learners. The ex-Model C schools apply to the previously advantaged and white schools under the apartheid regime. Hereafter, the term disadvantaged will be used without the prefix "previously".

[2] All schools in Cape Town are categorized in quintiles. The quintiles are defined by the location and income of the local community surrounding the school. State subsidies for schools are according to which quintile they are placed in. In the case of this study, Eaglewood was placed in a relatively high quintile because of the school's location. However, the learners in the school did not live in the community surrounding the school but in neighbouring townships. This was certainly unfortunate for the learners as the school fees were higher than the economic capabilities of the learners' families.

[3] A few learners were missing on the days the questionnaire was introduced in the four schools. Additionally, one grade 7 class in Freewill did not answer the questionnaire. The great majority of learners in Freewill had similar cultural and linguistic backgrounds. Having reached 75% of the learners, it was not considered necessary to have the fourth class answer the questionnaire.

[4] Only the learners with English, Afrikaans or isiXhosa as a home language are registered here.

[5] Five learners in Freewill answered that their home language was both English and Afrikaans. In the other three schools, the learners did not answer that they had two languages as their home language. The questionnaire was perhaps not specific enough in specifying learners'

need to report only their main language. It is, however, quite typical in South Africa for homes to use two or more languages.

6   A public servant strike influenced the last weeks of observations in particular in Xolani, which closed down during the strike. Activities in the other schools were minimally influenced as the teachers stayed home for only a couple of days and then resumed their positions.

7   Which is the WCED initiative on implementation of ICT in all public schools in the region

8   This is also confirmed by another research report from the University of Cape Town (Miller, Naidoo & Van Belle 2006).

9   A few learners in Xolani claimed they had one of the other African languages as their home language. They were recoded and not included in the calculations concerning home language.

Errata

Special thanks to the committee for thorough work when identifying errors in the original manuscript. Typographical errors (such as punctuation errors, missing/extra letters/words, misspellings and lack of coherent spelling) have been corrected. The remaining alterations are listed below in original and corrected version.

Page	Original text	Corrected text
Page 2, Ch. 1.0 last sentence before 1.1:	The summary connects the content of these papers to the concept of change and follows with a discussion on the contribution of this study to the research field	It connects the papers to the concept of change and explores the contribution of this study to the research field.
Page 8, paragraph 1, last line:	Are reproduced and deepened and of economic dependency reinforced	Are reproduced and deepened and of *(sic)* economic dependency reinforced
Page 9, paragraph 3, second sentence:	One of them is preparing extensive policy documents leading to educational reforms.	One of the alternatives is preparing strategic plans on ICT implementation (Department of Communications, 2010; Department of Education, 2004b; Khanya, 2010; Western Cape Education Department, 2010).
Page 11, Footnote 14:	For further reading…	Indicating use of computers as an administrative tool rather than using it for pedagogical purposes. For further reading…
Footnote 15:	The total number of public schools in the province is +/- 1500.	The total number of public schools in the province is +/- 1500. By the start of the 2012 academic year the aim is to have reached all the schools in the province.
Page 12, paragraph four, second sentence:	Using a term such as competence implies both basic ICT skills, such as being able to open, save, and write a document, as well as the competence required for using the opportunities ICT tools offer for a creative learning environment Whereas the term skill includes measureable elements, competence indicates a wider context. As used in this study, competence additionally includes attitudes, knowledge, motivation, and other less quantifiable elements.	Using a term such as competence implies both basic ICT skills, such as being able to open, save, and write a document, as well as the competence required for using the opportunities ICT tools offer for a creative learning environment (such as to evaluate quality of information, retrieving and producing new knowledge) and other less quantifiable elements.
Page 16, 2.1, first sentence:	Consenting that there is…	Consenting to the premise that there is…
Page 23, Footnote 25:	The framework is adapted from various sources within the digital divide literature, but it reflects…	The framework is adapted from various sources within the digital divide literature (Bridges.org, 2005; UNESCO, 2002b; van Dijk, 1999; van Dijk & van

		Deursen, 2010; Warschauer, 2004), but it reflects...
Footnote 26:	Here it applies to basic needs of every learner and teacher in a school context such as…	Here it applies to basic needs such as…
Page 24, line 6:	The emphasis on the material divide is reduced in this study.	The emphasis on the material divide is limited in this study.
Figure 4:	A cumulative understanding of the digital divide	A cumulative view of the digital divide
Page 29, first paragraph, first sentence:	The theoretical perspectives, which reflect the search for an appropriate theory synthesising ICT in education and development, will be presented in this chapter	The theoretical perspectives will be presented in this chapter. They reflect the search for an appropriate theory synthesising ICT in education and development,
Page 33, second full paragraph:	Using different languages when integrating ICT in education can, furthermore, have the capacity to generate the survival of languages and language diversity (Buszard-Welcher, 2001; Fantognan, 2005; Nathan, 2000; Paolillo, 2007). Language and ICT is, nevertheless, scarcely a central combination in existing research on the digital divide, as has already been discussed in Chapter 2.	Furthermore being able to use your home language when applying ICT can support the survival of language and language diversity (Buszard-Welcher, 2001; Fantognan, 2005; Nathan, 2000; Paolillo, 2007). However language and ICT are seldom a central focus in existing research on the digital divide as has already been discussed in Chapter 2.
Page 35, last sentence, paragraph one:	Despite previous discourse hegemony on ethnic and linguistic subordination, a clear imbalance still exists in South Africa based on a person's ethnicity and linguistic background.	sentence deleted
Second paragraph:	Township schools, with mainly black learners, have, in general, fewer resources and a different learning environment than the schools in typical middle class areas of Cape Town.	Township schools, with mainly black learners, have, in general, fewer resources and a different learning environment than the schools in typical middle class areas of Cape Town (Fiske & Ladd, 2004b; Motala et al., 2010; Oyedemi, 2009; Pillay, Roberts, & Rule, 2006; Soudien, 2004; Wilson, 2001).
Page 37, first line in last paragraph:	The concept of development and development theories have been closely connected to modernization theory and the underlying understanding that third world countries or 'traditional' societies can 'develop' according to Western paths	Development and development theories are closely connected to modernization theory and the underlying assumption that third world countries or 'traditional' societies can 'develop' according to Western paths
Page 39, first full paragraph, line 9:	argue that development produces economy, but in wider terms, societal and cultural aspects also decide life chances, health services, education and so on.	argue that development is important as it influences societal and cultural aspects such as life chances, health services, education and so on.

Footnote 33:	Substituting developing and developed, first world/third world, western/non-western with terms such as North and South is yet another problematic dichotomizing language connected to the field of development. Said (2003) connects this to the classification of us versus the other. No matter which concepts are used, none of them acknowledges the complexities or involves the obvious dispensations connected to the different definitions such as that powerful countries/areas are to be found in the South and in the North there are also areas of marginalised and less powerful countries.	Terms such as developing/developed, first world/third world, Western/non-Western have been replaced with terms such as North/South. Said (2003) connects such dichotomizing language to the classification of us versus the other. No matter which concepts are used, none of them acknowledges the complexities that exist nor the different definitions. Thus I acknowledge the fact that powerful countries/areas are to be found in the South and in the North there are also areas of marginalised and less powerful countries/areas.
Page 41, section 3.5, line 6:	Sen argues that the goal of development should be to expand the capabilities people enjoy through capabilities and functionings	Sen argues that the goal of development should be to expand choice or freedom people enjoy through capabilities and functionings
sentence beginning line 7:	The emphasis is away from what people can purchase with their income, and instead, the focus is on what people can do or be.	sentence deleted
Page 44, section 3.6, second full paragraph, line 7:	In that respect, educational systems…	Thus, educational systems…
Second paragraph, last sentence:	It should, however, be accentuated	However it should be emphasised that critical theories
Page 45, section 3.6.1 first paragraph:	Unwin argues that by using critical theories on technology in education, the focus moves to the social construction of technology and how external economical, political, social, and cultural factors influence the use of technology (Unwin, 2007, p.85).	Selwyn argues that by using critical theories on technology in education, the focus moves to the social construction of technology and how external economic, political, social, and cultural factors influence the use of technology (Selwyn, 2007).
Page 53: section 4.2.1 second paragraph:	When transferred to the mixed method model used in this study, it is a merged model of these two,	When transferred to the mixed method model used in this study, it is a merged model of these two (Creswell, 2009; Tashakkori & Teddlie, 1998),
Page 57, last paragraph:	The seventh grade learners are a suitable age group when it comes to communicating with them, which is easier in comparison to younger learners. I was also mindful of the high dropout rate, particularly with regard to black learners. Choosing older learners, who would probably have been able to reflect more on their computer use, might not have provided such an inclusive sample, as many of the black learners have already	The seventh grade learners are a more suitable age group when it comes to communication and reflection than younger learners. I was also mindful of the high drop-out rate, particularly with regard to black learners in higher grades (Abdi, 2001; Fataar, 1998). Therefore, choosing older learners might not have provided such an inclusive sample.

	dropped out of school at that level (Abdi, 2001; Fataar, 1998).	
Page 59, last paragraph: Footnote 49:	the school subscribed to educational software from Computers4kids. See online http://www.computers4kids.co.za/about.htm	the school subscribed to educational software from Computers4kids (2011). Footnote 49 deleted
Page 60, 4.3.2, line 2:	Notwithstanding, the situation for many of the learners is poor and a lot of them live under difficult conditions, often with various social problems in their homes	Nevertheless, many of the learners come from a poor background and live under difficult situations, often with various social problems at home
Page 62, 63, 64:		Specific time periods added for different parts of the fieldwork (months, year)
Page 69, second paragraph, first sentence:	The questionnaires were initially prepared for a direct outcome in a web-based sheet,	The questionnaires were initially prepared as a web-based sheet,
Page 70, second paragraph, line 6:	Patton (1990) identifies different triangulation processes in order to verify qualitative data material: 1) methods' triangulation, 2) data triangulation, 3) multiple analyst triangulations	Patton (1990) identifies different triangulation processes in order to verify qualitative data material: 1) methods' triangulation, 2) data triangulation, 3) multiple analyst triangulations (57) Footnote 57: Multiple analyst triangulations refer to more than one analyst (Patton, 1990).
Page 71, third paragraph:	From the discussion above, I would also like to argue that the dichotomy between the quantitative and the qualitative quality terms is not incompatible	Hence I argue that the difference between the quantitative and the qualitative terms is not incompatible
Page 79, last paragraph, last line:	The author argues, however, that despite digital equality in the sense that learners have obtained increased material access to ICT, digital equity has not yet been obtained. For that, a renewed policy focus is necessary to address the severe inequalities	The author argues, however, that despite digital equality in the sense that learners have obtained increased material access to ICT, digital equity based on ethical judgement in the sense of fairness has not yet been obtained.
Page 80, last paragraph, first sentence:	Supporting the implementation of an ambitious policy so that it provides disadvantaged learners and teachers new opportunities that lead to real change is emphasised in all the papers. Furthermore, many of the learners and teachers have the opportunity to use ICT only in school and cannot be considered as "digital natives"	In all the papers policy implementation is identified as important to provide disadvantaged learners and teachers new opportunities that lead to real change. Furthermore, many of the learners and teachers have limited opportunities to use ICT, which suggests that they are not "digital natives"
Page 81, first full paragraph:	…piloting and access can be considered…	…piloting and gaining access to the research site can be considered…