From digital divide to digital opportunities?
A critical perspective on the digital divide
in South African schools

Greta Björk Gudmundsdottir

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*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.

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

The global disparity of ICT, 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 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 perspective on the digital divide in South African classrooms and investigates how increased access to computers may, simultaneously, increase the opportunities of previously disadvantaged 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.

<table>
<thead>
<tr>
<th>Field</th>
<th>Paper I</th>
<th>Paper II</th>
<th>Paper III</th>
<th>Paper IV</th>
</tr>
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<tbody>
<tr>
<td>Focus</td>
<td>Methodology Reflective pilot studies</td>
<td>Comparative Education</td>
<td>ICT4D</td>
<td>ICT4D</td>
</tr>
<tr>
<td>Key words</td>
<td>pilot studies; qualitative research methods; action research; validity</td>
<td>digital divide; national policies; South Africa &amp; Iceland; student skills'; computer culture</td>
<td>digital divide; ICT integration; LoLT; teacher training; disadvantaged learners</td>
<td>capability approach; ICT skills; school use; home access; home language; digital divide; digital equity</td>
</tr>
<tr>
<td>Title</td>
<td>Explorative study on the importance of piloting to strengthen validity and research results.</td>
<td>A digital divide. Challenges &amp; opportunities for learners and schools on each side.</td>
<td>When does ICT support education in South Africa? The importance of teachers' capabilities and the relevance of language</td>
<td>From a digital divide to digital equity: The learners' ICT competence in four schools in Cape Town, South Africa</td>
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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)
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 interracial 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 schools⁶ 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

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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 (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) (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. 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. In a 2004 white paper, the then South African Minister of Education, Ms. Grace Naledi Mandisa Pandor, argued that:

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

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

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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”.\textsuperscript{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,\textsuperscript{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.\textsuperscript{14}

\textsuperscript{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).

\textsuperscript{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\textsuperscript{16} argues that transforming pedagogical practices with ICT goes hand in hand with greater ICT competence. Thus, ICT \textit{competence} is viewed in similar terms as digital competence within the European Union where the term competence relates to:

\begin{quote}
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).
\end{quote}

Additionally, the term literacy can be somewhat confusing\textsuperscript{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

\textsuperscript{16}When using “this author” or “this researcher” in the text it refers to the PhD candidate.
\textsuperscript{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.
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 (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).

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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%\textsuperscript{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\textsuperscript{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).

\textsuperscript{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.

\textsuperscript{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,
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\textsuperscript{24} in the study

\textsuperscript{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).

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>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.</td>
</tr>
<tr>
<td>Culture/Social Participation</td>
<td>Communities and individuals with higher levels of social contacts tend to make more use of ICTs.</td>
</tr>
<tr>
<td>Education</td>
<td>Lower levels of education are also shown to be associated with digital divides concerning access to and use of a range of ICTs.</td>
</tr>
<tr>
<td>Family structure</td>
<td>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.</td>
</tr>
<tr>
<td>Gender</td>
<td>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.</td>
</tr>
<tr>
<td>Geography</td>
<td>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.</td>
</tr>
<tr>
<td>Income socio-economic status</td>
<td>Lower levels of income are consistently shown to be associated with digital divides concerning access to and use of a range of ICTs.</td>
</tr>
<tr>
<td>Race</td>
<td>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.</td>
</tr>
</tbody>
</table>

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

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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 (Heugh, 2003; Kwaa Prah & Brock-Utne, 2009).

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

<table>
<thead>
<tr>
<th>Language</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>27.3%</td>
</tr>
<tr>
<td>Chinese</td>
<td>22.6%</td>
</tr>
<tr>
<td>Spanish</td>
<td>7.8%</td>
</tr>
<tr>
<td>Japanese</td>
<td>5%</td>
</tr>
<tr>
<td>Portuguese</td>
<td>4.2%</td>
</tr>
<tr>
<td>German</td>
<td>3.8%</td>
</tr>
<tr>
<td>Arabic</td>
<td>3.3%</td>
</tr>
<tr>
<td>French</td>
<td>3%</td>
</tr>
<tr>
<td>Russian</td>
<td>3%</td>
</tr>
<tr>
<td>Korean</td>
<td>2%</td>
</tr>
</tbody>
</table>

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. 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

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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.\textsuperscript{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.\textsuperscript{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.

\textsuperscript{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.

\textsuperscript{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, 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.

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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 neoliberal 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 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:

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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\textsuperscript{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 practices 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).\textsuperscript{38}

\textsuperscript{37} Critical theories will be addressed in plural, which indicates multiple approaches and various emphases.

\textsuperscript{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

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\(^{39}\) 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\(^\text{41}\) 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

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\(^{41}\) 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. 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.

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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.
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:
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 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.

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

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Ex-Model C school.

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, 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 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.

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, 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.

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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. 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. 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

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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, 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.

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

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. 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).

<table>
<thead>
<tr>
<th>Conventional terms</th>
<th>Naturalistic terms</th>
</tr>
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<tbody>
<tr>
<td>Internal validity</td>
<td>Credibility</td>
</tr>
<tr>
<td>External validity</td>
<td>Transferability</td>
</tr>
<tr>
<td>Reliability</td>
<td>Dependability</td>
</tr>
<tr>
<td>Objectivity</td>
<td>Conformability</td>
</tr>
</tbody>
</table>

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\textsuperscript{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

\textsuperscript{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/outside 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. 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.

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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.
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Appendices

Appendix 1. The pilot study – questionnaire
Appendix 2. Interview guide learners
Appendix 3. Interview guide teachers
Appendix 4. Interview guide principals
Appendix 5. Interview guide Khanya
Appendix 6. Questionnaire (English version)
Appendix 7. Research permit WCED Cornelissen
Appendix 8. Research permit Khanya
Appendix 9. Parental consent form (English and isiXhosa version)
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*  

<table>
<thead>
<tr>
<th>Programmes</th>
<th>Home/Outside School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Word processing (e.g. Word, Word-Perfect)</td>
<td>☐</td>
</tr>
<tr>
<td>Presentation programmes/Overheads (e.g. Powerpoint)</td>
<td>☐</td>
</tr>
<tr>
<td>Data calculations/spreadsheets (e.g. Excel)</td>
<td>☐</td>
</tr>
<tr>
<td>Computer games</td>
<td>☐</td>
</tr>
<tr>
<td>Educational software (to study particular subject e.g. computing skills, grammar etc.)</td>
<td>☐</td>
</tr>
<tr>
<td>Web design (e.g. Frontpage, Dreamweaver, NVU)</td>
<td>☐</td>
</tr>
<tr>
<td>Internet browser (e.g. Netscape, Internet Explorer)</td>
<td>☐</td>
</tr>
<tr>
<td>Educational platforms on the Internet (e.g. WebCT, Classfronter)</td>
<td>☐</td>
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<tr>
<td>Internet <strong>E-mail</strong> (e.g. Hotmail, Yahoo, Outlook, Eudora)</td>
<td>☐</td>
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<tr>
<td>Internet <strong>chat</strong></td>
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<tr>
<td>Internet <strong>conferences, discussion forums</strong></td>
<td>☐</td>
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<tr>
<td>Internet <strong>blog</strong></td>
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<tr>
<td>Internet <strong>games</strong></td>
<td>☐</td>
</tr>
</tbody>
</table>
13. Mark which programmes you use (or you have used) in school?

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

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
- [ ] 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

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

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 at school
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 outside 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...?
   
   **One answer in each row**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
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</tbody>
</table>

   **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...

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>blog on the Internet</td>
</tr>
<tr>
<td>[ ]</td>
<td>chat on the Internet</td>
</tr>
<tr>
<td>[ ]</td>
<td>copy material (text, pictures) from the Internet</td>
</tr>
<tr>
<td>[ ]</td>
<td>copy/download music from the Internet</td>
</tr>
<tr>
<td>[ ]</td>
<td>design web pages</td>
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<tr>
<td>[ ]</td>
<td>draw/design</td>
</tr>
<tr>
<td>[ ]</td>
<td>make presentations/overheads</td>
</tr>
<tr>
<td>[ ]</td>
<td>play computer games</td>
</tr>
<tr>
<td>[ ]</td>
<td>play Internet games</td>
</tr>
<tr>
<td>[ ]</td>
<td>programme software</td>
</tr>
<tr>
<td>[ ]</td>
<td>seek information on a CD Rom</td>
</tr>
<tr>
<td>[ ]</td>
<td>seek information on the Internet</td>
</tr>
<tr>
<td>[ ]</td>
<td>use data calculations</td>
</tr>
<tr>
<td>[ ]</td>
<td>write text</td>
</tr>
</tbody>
</table>

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?

One answer in each row

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

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

One answer in each row

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

You can answer more than one alternative

- 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
Ms Greta Gudmundsdottir
Institute for Educational Research
University 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: Goeie Hoop Primary, Thembali Public, Liebenberg Primary, Atlantis Secondary, Bellville South Secondary and Groenberg Secondary.
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
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.

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>LOCATION</th>
<th>TYPE</th>
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</table>

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
cahrens@pgwc.gov.za
MOBILE: +2783 7044766
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
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


[Name of principal]
Inqununu

IPHETSHANA LEMPENDULO

Mna Mnu./Nkoskz._____________umzali ka_________________ IBanga_______

ANDIMVUMELI umntwana wam ukuba athabathe inxaxheba kolu phando lokusetyenziswa kwee-khompuytha.
(Unokurhoxa nanini na ngaphandle kokudlele indlala ukuba ukhethe ukungaqhubekeni nolwabo phando).

Intsayino-gama yomzali:________________________  Umhla:__________
Bazali ababekekileyo


Ndinyakholwa ukuba abafundi baya kuzuza lutho kolu phando. Olu phando lunokwandisa ulwazi lwabo ngokusetyenziswa kweekhompyutha i-Intanethi kunye neeselofion. Kwakhona, iziphumo zolo phando ziza kuncedwa ooititshala nabaphathi ukuba bakuqonde ngcono ukufikeleleka kweekhompyutha, i-Intanethi kunye neeselofion ebantwani, ukuze babone ukuba bafuna inkxaso nenkuthazo engaphaya. Ulwazi uluqokelelweyo alusakwachaphazela amanqaku omntwana wakho nangayiphi na indlela.

Ukuba uyavuma, akukho nto kufuneka uyenze. Imvume yakho iza kuthatathwa, 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
**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.

<table>
<thead>
<tr>
<th>Page</th>
<th>Original text</th>
<th>Corrected text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page 2, Ch. 1.0 last sentence before 1.1:</td>
<td>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.</td>
<td>It connects the papers to the concept of change and explores the contribution of this study to the research field.</td>
</tr>
<tr>
<td>Page 8, paragraph 1, last line:</td>
<td>Are reproduced and deepened and of economic dependency reinforced</td>
<td>Are reproduced and deepened and of (sic) economic dependency reinforced</td>
</tr>
<tr>
<td>Page 9, paragraph 3, second sentence:</td>
<td>One of them is preparing extensive policy documents leading to educational reforms.</td>
<td>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).</td>
</tr>
<tr>
<td>Page 11, Footnote 14:</td>
<td>For further reading…</td>
<td>Indicating use of computers as an administrative tool rather than using it for pedagogical purposes. For further reading…</td>
</tr>
<tr>
<td>Footnote 15:</td>
<td>The total number of public schools in the province is +/- 1500.</td>
<td>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.</td>
</tr>
<tr>
<td>Page 12, paragraph four, second sentence:</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>Page 16, 2.1, first sentence:</td>
<td>Consenting that there is…</td>
<td>Consenting to the premise that there is…</td>
</tr>
<tr>
<td>Page 23, Footnote 25:</td>
<td>The framework is adapted from various sources within the digital divide literature, but it reflects…</td>
<td>The framework is adapted from various sources within the digital divide literature (Bridges.org, 2005; UNESCO, 2002b; van Dijk, 1999; van Dijk &amp; van...</td>
</tr>
<tr>
<td>Footnote 26:</td>
<td>Here it applies to basic needs of every learner and teacher in a school context such as…</td>
<td>Deursen, 2010; Warschauer, 2004), but it reflects… Here it applies to basic needs such as…</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td><strong>Page 24, line 6:</strong></td>
<td>The emphasis on the material divide is reduced in this study.</td>
<td>The emphasis on the material divide is limited in this study.</td>
</tr>
<tr>
<td>Figure 4:</td>
<td>A cumulative understanding of the digital divide</td>
<td>A cumulative view of the digital divide</td>
</tr>
<tr>
<td><strong>Page 29, first paragraph, first sentence:</strong></td>
<td>The theoretical perspectives, which reflect the search for an appropriate theory synthesising ICT in education and development, will be presented in this chapter</td>
<td>The theoretical perspectives will be presented in this chapter. They reflect the search for an appropriate theory synthesising ICT in education and development.</td>
</tr>
<tr>
<td><strong>Page 33, second full paragraph:</strong></td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Page 35, last sentence, paragraph one:</strong></td>
<td>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.</td>
<td>sentence deleted</td>
</tr>
<tr>
<td>Second paragraph:</td>
<td>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.</td>
<td>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 &amp; Ladd, 2004b; Motala et al., 2010; Oyedemi, 2009; Pillay, Roberts, &amp; Rule, 2006; Soudien, 2004; Wilson, 2001).</td>
</tr>
<tr>
<td><strong>Page 37, first line in last paragraph:</strong></td>
<td>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</td>
<td>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</td>
</tr>
<tr>
<td><strong>Page 39, first full paragraph, line 9:</strong></td>
<td>argue that development produces economy, but in wider terms, societal and cultural aspects also decide life chances, health services, education and so on.</td>
<td>argue that development is important as it influences societal and cultural aspects such as life chances, health services, education and so on.</td>
</tr>
</tbody>
</table>
**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.

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**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. The emphasis is away from what people can purchase with their income, and instead, the focus is on what people can do or be.

Sen argues that the goal of development should be to expand choice or freedom people enjoy through capabilities and functionings. Sentence deleted.

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**Page 44, section 3.6, second full paragraph, line 7:** In that respect, educational systems…

It should, however, be accentuated.

Thus, educational systems…

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.
<table>
<thead>
<tr>
<th>Page</th>
<th>Paragraph/Line</th>
<th>Original Text</th>
<th>Corrected Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>last paragraph</td>
<td>dropped out of school at that level (Abdi, 2001; Fataar, 1998).</td>
<td>the school subscribed to educational software from Computers4kids.</td>
</tr>
<tr>
<td></td>
<td>Footnote 49</td>
<td>Footnote 49: See online <a href="http://www.computers4kids.co.za/about.htm">http://www.computers4kids.co.za/about.htm</a></td>
<td>Footnote 49 deleted</td>
</tr>
<tr>
<td>60</td>
<td>4.3.2, line 2</td>
<td>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</td>
<td>Nevertheless, many of the learners come from a poor background and live under difficult situations, often with various social problems at home</td>
</tr>
<tr>
<td>62, 63, 64</td>
<td></td>
<td>Specific time periods added for different parts of the fieldwork (months, year)</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>second paragraph, first sentence</td>
<td>The questionnaires were initially prepared for a direct outcome in a web-based sheet,</td>
<td>The questionnaires were initially prepared as a web-based sheet,</td>
</tr>
<tr>
<td>70</td>
<td>second paragraph, line 6</td>
<td>Patton (1990) identifies different triangulation processes in order to verify qualitative data material: 1) methods’ triangulation, 2) data triangulation, 3) multiple analyst triangulations</td>
<td>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).</td>
</tr>
<tr>
<td>71</td>
<td>third paragraph</td>
<td>From the discussion above, I would also like to argue that the dichotomy between the quantitative and the qualitative quality terms is not incompatible</td>
<td>Hence I argue that the difference between the quantitative and the qualitative terms is not incompatible</td>
</tr>
<tr>
<td>79</td>
<td>last paragraph, last line</td>
<td>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</td>
<td>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.</td>
</tr>
<tr>
<td>80</td>
<td>last paragraph, first sentence</td>
<td>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”</td>
<td>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”</td>
</tr>
<tr>
<td>81</td>
<td>first full paragraph</td>
<td>…piloting and access can be considered…</td>
<td>…piloting and gaining access to the research site can be considered…</td>
</tr>
</tbody>
</table>