Multilingualism and ICT education at Rhodes University: an exploratory study

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ABSTRACT

In South Africa, the linguistic hegemony of English over the African languages in the academic field reproduces unequal power relationships between their speakers. The present study shows that an intervention shaped by a counter-hegemonic ideology can change the attitudes of Black university students, key players in spearheading social change. Usign statistical analysis and survey methodologies, this research explored the hegemonic role of English as the only language of learning and teaching (LoLT) in the discipline of Computer Science (CS) at Rhodes University. The study found that those speakers of an African language who are the most disadvantaged by the use of English as LoLT are also the most likely to resist a more extensive use of their mother tongue as an alternative. A group of such students were involved in the development and use of an on-line glossary of CS terms translated, explained and exemplified in an African language (isiXhosa). This experience increased the support for the use of African languages as additional LoLT, even in the English-dominated field of study of Computer Science. This is an initial step towards promoting linguistic equality between English and African languages and social equality between their speakers.

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African: the word "African" is generally used to refer to anything that pertains to or originates from Africa. In the South African context, the term has acquired strong political connotations. With reference to people, it can be used in three different ways, ranging from a broader to a narrower sense. In the broader sense, an "African" can include anybody who was born on the African continent. In South Africa, this would include individuals from all races, including so-called Coloureds, Indians and Whites. In a slightly more restrictive sense, the term can be used to refer to anyone who can trace their origins to Africa. This makes the position of many (especially, but not only Afrikaans-speaking) Whites quite contentious. Although their origin can be ultimately traced to Europe, they can trace their family history back many generations in Africa. Most importantly, they identify very strongly with the African continent. In a narrow sense, the word "African" can be used to refer to individuals classified as "Black" under Apartheid and distinguish them from Coloureds, Asians and Whites. This interpretation is restrictive and reminiscent of the discriminatory policies of the past, and is therefore becoming less and less common. However, it highlights distinctions, inherited from the Apartheid era, which are still reflected in South Africa today. Taking language as an example, Afrikaans is a fully developed language suitable for every purpose in society. African languages, one could argue, lack the resources and support to be used in high-status domains. For the purpose of this study, "African languages" include only the nine indigenous South African languages previously classified as "Black" languages. With reference to speakers of such languages as a first language, however, the term "Black" is used.

Afrikaans: Afrikaans is a neo-Germanic language born in Africa from a pidgin based on Dutch, English, French, Malay, Khoi-San and a number of other languages. It is spoken by 5.9 million people, many of whom are individuals formerly classified as "Coloureds". Under Apartheid, it was the main language of government and one of the two languages of government, together with English. An attempt to promote its use as a medium of

instruction in Black schools (arguably to extend the number of its speakers at the expense of English) was one of the reasons sparking the Soweto uprising of 1976. It is still used as a medium of instruction at all levels, including university (e.g. at Stellenbosch, University of Pretoria, etc.) While it is still an important language for South Africa, its role in the education of Black students is not comparable to that of English.

Apartheid: "Apartheid" literally means "separateness" in Afrikaans. From 1948 to 1994 a policy of "separate development" based on discrimination along ethnic lines shaped South African politics and virtually every aspect of daily life. Through unequal distribution of resources and political rights, it imposed a hierarchical structure with Whites in the highest positions, followed by Asians, Coloureds and finally Blacks. In spite of the efforts of government and civil society, its legacy inevitably affects today's South Africa. Indicators suggest that inequality is *de facto* increasing and transformation proceeds at a slow pace, leading some to argue that Apartheid based on census has substituted the one based on race.

Asian: under Apartheid, individuals of Asian origin were classified as "Asians". Although, like individuals classified as "Blacks", Asians could only reside in designated areas and were subjected to a specific education system, they arguably had access to better resources and education. Asians included people of different ethnic origin which could be traced back to Asia, such as Chinese, Malay, etc. Historically, however, the Indian community concentrated mainly in the area around Durban in KwaZulu-Natal constitutes the most prominent example of individuals in this group. Although languages such as Hindi and Gujarati are used for religious purposes, Indians are usually associated with the use of English as a home language.

Bantu Education: under Apartheid, the education of individuals classified as "Blacks" was regulated by the Bantu Education Act of 1954 and put under the control of the Department of Education and Training (DET). The explicit goal was to relegate Blacks to a subordinate position in society. Within this system, mother-tongue education was coupled with underfunding and low academic standards.

Black: under Apartheid, individuals of indigenous African origin were classified as "Blacks". Such individuals had limited political rights and could hold permanent residence in designated areas (homelands or townships). Blacks were subjected to a specific education system, called Bantu Education, managed by the South African Department of Education and Training (DET). For this reason, rural and township schools attended by speakers of an African language are frequently called former DET schools. For the purpose of this study, however, the word "Black" is used to refer to people of African origin and to institutions characterised by their presence (e.g. "Black schools"). This is part of a conscious effort to rehabilitate the term, consistent with my pro-African ideological stand. It also allows for more precision and consistency with the use of other terms such as White or Coloured.

Coloured: under Apartheid, individuals of mixed or uncertain ethnic origin were classified as "Coloured". Although, like individuals classified as "Blacks", Coloureds could only reside in designated areas and were subjected to a specific education system, they arguably had access to better resources and education, Unlike in the United States, in South Africa the term "Coloured" does not denote every non-White and non-Asian individual. It refers to a group identified by specific characteristics and often associated with the use of a particular variety of Afrikaans.

Computer Science (CS): this is a recognised subject of study which students can take up to the major level within a Bachelor of Science degree at Rhodes University, the site of my research. For the purpose of my study, I use the term in a broader sense to refer to any computer-related subject. This includes mainstream courses in Computer Science (e.g. Csc101, Csc102, etc.); Computer Literacy (CSc1L) as well as Computer Skills for Science (CS1S); Commerce (CS1C) and Humanities (CS1H). Such a comprehensive definition is intended to emphasise the link between all levels of computer-related courses, and the importance of basic computer literacy in providing the foundations for more advanced courses involving more specialised knowledge.

Computer Studies: Formerly Computer Studies was a high school subject which could be taken at the Higher and Standard Grade. It was recently replaced by Information Technology (IT) and Computer Applications Technology (CAT). Since the new terminology has recently been adopted and not everybody is familiar with it, the old one has been used instead. The term is never abbreviated, to avoid confusion with Computer Science.

Elite: a powerful group in society with considerable economic and political power. Under Apartheid, the elite could be identified, to some extent, with the White minority. In the new South Africa, the term can be used to include members of previously marginalised groups (mainly the African middle class), who are acquiring more and more prominence. For the purpose of this study, the latter, broader definition is used.

Extended Studies Programme (ESP): this is the foundation programme which, since 2005, was run by the Extended Studies Unit of Rhodes University. For the purpose of this study, the more general term "foundation", which includes students enrolled in 2004, is used. Foundation programmes provide alternative access to tertiary education for South African students from a marginalised background. Foundation students have recognised academic potential, but would not normally meet the requirements for admission in mainstream courses. In the case of Computer Science, these would, prior to before**,** 2009, have been a minimum of 35 Swedish points in Matric and a pass in Mathematics at the Higher Grade.

First language: this is a person's stronger language. In the case of a monolingual, this coincides with his or her home language and mother tongue. In the case of a bilingual, determining one's first language can be more problematic, as different languages are often used in different domains and with different levels of proficiency. For the purpose of this study, the term refers mainly to the role a language had in one's schooling, i.e. whether it was studied as a first or as a second language.

Home language: this is a term used in curriculum and policy documents in South Africa. It refers to the language (or languages) people use at home. For the purpose of this study, I use the term "home language" to refer to the self-reported language with which an individual identifies. In this sense, saying that English is the home language of a portion of the African middle class refers to the aspirations and linguistic orientation of this group. It does not necessarily imply that, from a linguistic point of view, its members can be considered as native speakers of English.

Homeland: under Apartheid, the homelands (also called bantustans) were politically autonomous areas within South Africa where individuals classified as "Black" could hold permanent residence. While formally recognising them as independent states, the South African government exerted a strong political and economic influence on the homelands. Rather than autonomous countries, they could probably be compared to Indian reservations in the USA or Palestinian territories in the Middle East. In this sense, the homelands system was seen by many Blacks and by a portion of the international community as a way to marginalise Black South Africans and deny their political rights, by containing them within underdeveloped and impoverished "puppet states" which became reservoirs of cheap labour. Consistent with the Apartheid divide-and-rule policy, separate homelands were instituted for speakers of different languages: Gazankulu (Xitsonga), KaNgwane (siSwati), KwaNdebele (isiNdebele), KwaZulu (isiZulu), Lebowa (Sepedi), QwaQwa (Sesotho), Venda (Tshivenda), Bhoputhatswana (Setswana), Transkei and Ciskei (isiXhosa).

ICT education: this refers to the use of Information and Communication Technology in education in general. A distinction can be made between the use of ICT as a teaching tool and the teaching of ICT as a subject. Both dimensions are relevant for my research. On the one hand, I use an ICT tool to tackle some of the problems commonly associated with the use of African languages in the academic domain. On the other hand, I focus on the teaching of an ICT-related subject, i.e. Computer Science.

IsiXhosa: isiXhosa is a Southern Bantu language of the Nguni family and is mutually intelligible with isiZulu, isiNdebele and siSwati. It is spoken by 7.9 million people, mainly concentrated in the Western and Eastern Cape provinces (approximately 18% of the South African population, it is the second biggest language group after isiZulu speakers). Since my research is based in a predominantly isiXhosa-speaking area, I pay particular attention to this language and its speakers. My intention, however, is to discuss and experiment with a model which, if proven successful, could be applied to other African languages in South Africa.

Language of learning and teaching (LoLT): this term can be used to refer to any language used in the educational context to support either learning or teaching. It is therefore broader and more flexible than "medium of instruction". It is commonly used in South African education, especially in relation to Outcomes Based Education.

Marginalised: I use this term to refer to members of previously disadvantaged groups who are still in a subordinate position in the new South African society. Although the actual meaning of marginalisation in this context can be contentious, I use this term mainly to refer to Blacks of both genders who live in rural areas or townships. Whenever I use the term to refer to Coloureds, Asians, women or members of the African middle class I put every effort into making this clear.

Medium of instruction: this is a language used in educational settings to teach a specific subject. It is usually associated with formal rather than informal educational contexts, and with official language policy rather than actual language use. In official documents, the terms "medium of instruction" has been replaced by "language of learning and teaching".

Middle class: the term, originally coined within the Western context, does not easily fit in the African context. However, I use it with reference to individuals from all ethnic groups who express a Western middle-class orientation. In this sense, the term reflects a general

orientation rather than an actual prominent position in society. In South Africa, most students who attend schools for speakers of English as a first language (EL1 schools) can be considered members of this group. This includes members of the emerging African middle class.

Mother tongue: this refers to the language most closely connected with a person's identity and cultural heritage. It is the language in which most people learn to speak, and remains strongly connected to the intimate sphere. The term "mother tongue" has been replaced by "home language".

Previously disadvantaged: this is a "politically correct" way of referring to individuals who were discriminated against under Apartheid. This includes Blacks, Coloureds, Asians and women from all groups, including Whites. The use of the word "previously" is somewhat contentious, since members of most such groups are still in a subordinate position in the new South African society. In my thesis, I prefer to use the term "marginalised".

Rural area: in South African terms, "rural area" is commonly used to refer to vast areas where subsistence farming and livestock are the primary activities. Many such areas are situated in the former homelands, and are often characterised by endemic poverty, lack of infrastructure and services. For the purpose of this study, this is the most relevant interpretation.

School for speakers of English as a first language (EL1 Schools): this refers to schools where English is taught as a primary (or in South African terminology, "home") language, the assumption being that learners have exposure to English outside the school and can thus function as first-language speakers. This includes many schools formerly reserved for Coloureds, Asians and Whites. Although some of the Black students considered in this study attended former "Coloured" schools where English is taught as a first language, for the purpose of this study the term "EL1 schools" refers mainly to schools previously reserved mainly for White individuals, where educational and linguistic standards are relatively high.

For the purpose of this study, students who attend EL1 schools and write English as a home language language in Matric are referred to as "EL1" students. Please note that, although useful for the purpose of the present study, the terms first and second language are no longer used in the South African curriculum and policy documents.

School for speakers of English as a second language (EL2 schools): this refers to a school where English is taught and studied as a second (or in South African terminology, "additional") language. Schools formerly reserved for individuals classified as "Coloureds", where Afrikaans is the medium of instruction, and former DET schools fall almost invariably under this category. For the purpose of this study, schools formerly reserved for individuals classified as "Whites", where Afrikaans is the medium of instruction, are not considered. The term "EL2 school" almost invariably refers to the linguistic as well as the educational and socio-economic background of the students. For the purpose of this study, students who attend EL2 schools and write English as a second language (or in the new South African terminology, "first additional language") in Matric are referred to as "EL2" students. Although the term "English Additional Language (EAL)" is considered more politically correct in South Africa and is increasingly used internationally, the acronym EL2 is used in this thesis for the sake of consistency with EL1,

Township: under Apartheid, townships (also called "locations") were the areas of urban settlement designated for non-Whites. Like rural areas, townships are characterised by endemic poverty, lack of infrastructure and services and, not uncommonly, high crime rates.

White: under Apartheid, individuals of European origin were classified as "Whites". Such individuals were the only ones to enjoy political rights and benefit from privileged education. Most White people are either speakers of English or Afrikaans (or both) as a home language. English-speaking Whites are often associated with strong economic power and an international orientation, mainly expressed in terms of historical ties with Britain. Afrikaans-speaking Whites are often referred to as Afrikaners. Under Apartheid, Afrikaners controlled most of the government structures. For this reason, Afrikaans is often associated

with the oppressive and discriminatory policies of the past in the minds of many South Africans.

Working class: in a country characterised by an 80% unemployment rate, the term makes little sense. In my study, it is used mainly with reference to European theories in so far as comparison is useful with the subordinate class of the population.

Foreword

This research was born out of my passion for language issues on the one hand and for computers on the other. It is, by its very nature, both exploratory and multi-disciplinary. This reflects my life path as well as my educational background. I grew up in a part of Italy which enjoys political autonomy partly because of its linguistic diversity (Italian, German, Ladino and a number of Italian dialects which are not mutually intelligible with the standard variety). For most of my adult life, I have lived and studied in foreign countries (UK, Scandinavia and, now, South Africa) and have learnt to function in a second language (English). This has exposed me to a variety of new and radically different contexts, in which I have experienced both sides of the "language divide".

My interest in computers begun as a child (I could do basic programming by the age of ten, long before I started learning English in school), and I consider myself part of the first generation of Italians who "grew up digital". Unfortunately, my interest in computers was frustrated during my teenage years and in my early twenties by the worsening condition of my eyesight. I am affected by retinitis pigmentosa, which could be roughly described as hypersensitivity to light and glittering. This made it difficult for me to use the Graphical User Interface of mainstream operating systems (e.g. Windows 95) which, by that time, were becoming more and more common. My passion for computers knew a second wind in recent years, partly in connection with the research presented here. The discovery of open-source software made it possible for me to customise systems enough to make it comfortable for me to use computers again. At the present stage, I rely on the use of scanners and on electronic material (which I can magnify and for which I can change colour schemes, etc.) Since reading standard-size fonts on a white background has become impossible for me, this is the only way I can continue with my research and my academic work.

My educational background, starting with a scientific Matric, includes Economics, Sociology, Linguistics, Education and, in more recent years, Computer Science. The common thread throughout my study career has been an interest in issues of access to education for members of minority groups, from various angles. I feel a multidisciplinary perspective is probably the main

contribution I can bring to my study. Based on my relatively short experience as a young researcher and academic, I realise that, in some cases, this might confuse the reader. Experts in various fields will probably see “something” of their discipline in my work, but not enough of it.

I hope such readers will appreciate the genuine intellectual curiosity which prompted me to explore the unlikely combination of computer education and African languages, rather than focus on the possibly superficial way in which I drew on different disciplinary discourses. This is part of a conscious attempt to remain to some extent “foreign” to all disciplines, in order to be able to maintain a truly critical stand, outside discipline-specific terms of reference which determine both discourse and counter-discourses. The originality of what I have done has attracted the interest of the academic community both in South Africa and internationally, as reflected by a number of publications which have resulted from my research.

Acknowledgements

I would like to dedicate this thesis to my late grandmother, Loreta, who always emphasised the importance of education in my life and would have been very proud. I would also like to thank my parents, Pia and Luciano, and my sister Monica for supporting me morally and financially during my studies, which have lasted basically all my life so far. I would also like to thank Mmachuene, who has always been close to me in these years.

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Development (SANTED) programme at Rhodes, and the Rhodes Education Department. At different times, these programmes and sections made it possible for me to continue with my work. I must also acknowledge Dr Peter Clayton, Prof Russell Kaschula, Prof Marc Schafer, Prof George Euvrard and, once again and above all, Prof Alfredo Terzoli for believing in me and making this research possible.

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CHAPTER 1: INTRODUCTION

The purpose of this chapter is to provide a brief introduction to my research. I discuss the background to the research and the research goals. I end this introductory chapter with an outline of the structure of the thesis.

1.1 Background to the research

South Africa is a multilingual country. The vast majority of its population (approximately 80% according to Statistics South Africa 2001) is made up of speakers of an African language. Most of them are not fully proficient in English (Webb and Kembo-Sure 2000). In spite of this, English is still used as the Language of Learning and Teaching (LoLT) in most Black schools from Grade 4 onwards (Taylor and Vinjevold 1999). The role of Afrikaans is shrinking. Because of the relatively marginal role Afrikaans plays in the education of speakers of an African language, most of the discussion in my thesis pertains to the role of English and the indigenous African languages, especially isiXhosa, as LoLT.

For historical reasons, in South Africa a home language is inevitably linked to social, economic and educational background. Under Apartheid, Black students were largely denied physical access to quality education, which was reserved for individuals classified as "Whites". Speakers of African languages were also denied meaningful access to the study of English or Afrikaans both as LoLT and as second languages. At the same time, mother-tongue education in schools for individuals classified as "Blacks" was coupled with poor quality and underfunding. This combination contributed to denying *epistemological access* (Morrow 1993) to relevant and empowering knowledge for speakers of languages other than English and Afrikaans. Since 1994, more and more members of the emerging African middle class have acquired physical access to the quality education previously reserved for Whites. It is debatable, however, whether physical access of these individuals to historically White schools and universities corresponds to a more equal epistemological access between speakers of English and an African language (Mullis 2003).

As part of the legacy of apartheid, African languages are often associated with low-status domains and poor quality of education. This is an obstacle to experimenting with their use as additional LoLT. The use of African languages alongside English in high-status disciplines has the potential to facilitate access to empowering knowledge for many Black students. However, before such an approach can even be tested, it is necessary to increase the support for the use of African languages among their own speakers and to challenge the role of English as the *sole* LoLT.

My research focused on Black students of Computer Science at Rhodes University. Rhodes is a traditionally English-medium university (de Klerk 2001) situated in the predominantly isiXhosa-speaking Eastern Cape. It is characterised by a strong international orientation and hosts several projects for the promotion of English (e.g. the Institute for the Study of English in Africa and the National Lexicography Unit for South African English). According to the new language policy (RULP 2005), the institution, although committed to retaining English as LoLT, acknowledges the multilingual nature of its community and is committed to promoting the role and status of the other two most widely spoken languages of the province, i.e. Afrikaans and isiXhosa. In the years 2004 – 2008, the status of African languages at Rhodes University was positively affected by two events: a shift towards a more progressive leadership (see Badat 2008) and the start of the South African-Norwegian Tertiary Education Development (SANTED)[1] multilingualism programme. I see my study as part of such transformation.

One of the assumptions underlying my study was the belief that the use of African languages could support the learning of computer literacy. The choice of a prestigious and traditionally English-medium institution such as Rhodes and of an English-dominated subject in the high-status field of ICT posed an exciting research challenge. Using a variety of methods (statistics, questionnaires, interviews and observation) I explored the relationship between language and

[1] This is the fruit of collaboration between the Norwegian Government and the South African Department of Education. It sponsors several projects for the development of skills at various South African institutions. At Rhodes University, it sponsors a programme for the promotion of isiXhosa, in realisation of the Rhodes Language Policy (RULP 2005). The programme started at the beginning of 2007 and it is hosted by the Rhodes School of Languages (African Languages Section). The programme focuses on three main activities. The first is the promotion of African scholarship. Young researchers are encouraged to undertake research on isiXhosa, its use and development both in higher education and elsewhere. The second activity is the teaching of isiXhosa as a second language. Language courses have been designed and are currently taught to staff members and students in the Departments of Law and Pharmacy. These two sets of students were chosen because, as part of their degree, they are required to engage with the community from the local township.

academic performance in Computer Science. The understanding gained in the process helped me to shape an intervention involving the development and use of additional teaching material in an African language.

The University realises that the current enrolment of isiXhosa-speaking students is unacceptably low, and it is expected to increase in the coming years (Badat 2008). Currently, the institutional strategy to increase access and retention of students from marginalised communities consists of admission through a bridging (or foundation) programme. In the Rhodes Extended Studies Programme (ESP) the student is exposed to the culture of the University and develops the concepts, skills and language of the curriculum. In my research I challenge this approach, which entrenches the dominant role of English in tertiary education, in favour of a more extensive use of African languages.

All foundation students take a compulsory computer literacy course (Computer Skills) specifically geared towards their intended academic career. It is designed to equip students with basic skills and covers Word Processing, Spreadsheets, Presentations, Databases, Web Browsing and Design, E-Mailing and Programming. Classes consist of approximately 40 students, most of whom are speakers of isiXhosa who attended township and rural schools. The scope of the course, class size and type of students made this the ideal target group for my practical intervention.

1.2 Research goals

The purpose of my study is to make a case for bilingual education in all subjects. My research is an initial step in this direction, by creating the preconditions for a more extensive use of African languages as additional LoLT in an economically empowering but English-dominated field of study at university. The question informing my study is: “How can the ideological balance between LoLT in the ICT field be shifted in favour of more extensive use of an African language?”. Answering this question is my overarching goal, and can be articulated as two separate but interrelated research goals.

The **first goal** of my study is to gain a better understanding of the relationship between language and power in tertiary education. I do this by comparing the performance and language attitudes of students with different levels of English proficiency. My tentative hypothesis is that students who are most disadvantaged by the use of English are the most resistant towards the use of an African language as additional LoLT.

The second goal of my study is to involve a group of such students in the development and use of resources in isiXhosa for Computer Science. My tentative hypothesis is that experiencing the use of an African language in an economically empowering and English-dominated discipline such as Computer Science improves students' attitudes towards the use of African languages as LoLT.

Both hypotheses were confirmed by my findings. My assumption is that more favourable attitudes towards African languages among their speakers would contribute to a more extensive use of such languages as LoLT. Increased use of African languages has the potential to narrow the gap in academic performance between speakers of English and of African languages, even in a technological field such as Computer Science. This, however, goes beyond the scope of an exploratory study such as the one presented here.

1.3 Structure of the thesis

In the previous section I gave the reader some background information in order to contextualise my research. The rest of my thesis can be divided into three main parts. Chapters 2, 3 and 4 deal with the theoretical framework of my study. Chapter 5 discusses methodological issues at a general level. More detail specific to each of the three components of my research, i.e. statistical analysis, language attitudes survey and practical implementation, is provided in Chapters 6, 7 and 8 respectively. These also provide a discussion of my findings. Like the present one, Chapter 9 is a relatively short chapter. Its purpose is to summarise my study and draw some conclusions. Various appendices provide additional information.

In **Chapter 2** I define key concepts and the relationships between them. I discuss the role of education in reproducing power structures between dominant and dominated groups in society. In

an African post-colonial context, the linguistic, cultural and academic dependency of developing on developed countries is reflected in the way Westernised elites control access to education, and particularly tertiary education, by setting the terms of reference for the academic discourse and by shaping language policy in education. In a democratic country like South Africa, this cannot be imposed by force, but must be accepted by the majority of the population. This means that the linguistic hegemony of English, endorsed by these policies, rests to a large extent on acceptance by the very students it disempowers and marginalises, i.e. speakers of an African language. Language attitudes can be seen as indicators of overt support (or lack thereof) for a particular language.

In **Chapter 3** I draw on past studies to explore the linguistic hegemony of English. Statistical research highlights the role of English proficiency in determining academic success. Research on language attitudes shows that Black students at university have mixed feelings about English, while considering African languages more suitable within low-status domains. Association with low-status domains has also shaped interventions which, in different contexts, have attempted to promote the use of African languages in tertiary education. Although the findings and lessons learnt in these studies are taken into account in my research, the main purpose of this chapter is to provide evidence of how English linguistic hegemony determines performance, attitudes and interventions.

In **Chapter 4** I highlight how the use of African languages in the academic context, and particularly in fields of study such as Computer Science, can contribute to improving their status and empower their speakers. The integration of African cultural and linguistic aspects into the development of ICT resources and the teaching of Computer Science was an important feature of my intervention. Such integration can contribute to counter dependency on the West and exclusive reliance on English. I motivate my focus on the "unpacking" of English technical terms into the students' mother tongue in terms of students' experiences at primary and secondary levels as well as specific features of the scientific academic discourse. While this explains my intervention at the lexico-grammatical level, it is important to bear in mind that the main overall focus of my research is to bring about attitudinal change and not improve understanding of technical concepts.

In **Chapter 5** I discuss the methodological aspects of my research. The exploratory and multi-disciplinary character of my study, at the crossroad between Education, Linguistics and Computer

Science, is reflected in my methodological choices. I draw on three different paradigms, i.e. Critical Pedagogy, Functional Linguistics and Ethnocomputing, and subscribe to a combination of different approaches, ranging from statistical research and questionnaire survey to case study and action research. This is part of a conscious attempt to remain external to any discipline-specific methodological framework, consistent with my view of education as an hegemonic tool which operates through powerful discourses to reproduce existing power structures. In order to achieve my research goals, i.e. deconstructing and challenging linguistic hegemony, I rely on a variety of methods, e.g. statistical analysis, questionnaires and interviews, classroom observation, content and system design. I discuss some of the challenges relating to the use of each method, as well as ethical considerations and reflections on my role as a researcher. More details relating to each of the three components of my research, i.e. statistical analysis, attitudes survey and practical intervention, are provided in Chapters 6, 7, and 8 respectively.

In **Chapter 6** I present the findings of my statistical analysis. I take into consideration the performance, measured in academic achievement and longevity, of CS students at Rhodes over the past six years. I restrict the sample to mainstream students of Computer Science who are also South African citizens and speakers of either English or an African language. The impact of language and various other factors is assessed by comparing different groups of students. With respect to this, I paid particular attention to Black students who wrote English as a first as opposed to a second language in Matric, foundation students who continued their studies in Computer Science, and isiXhosa-speaking students. In different ways, comparison between the performance of these students with the rest of the sample is used to isolate the impact of language from that of socio-economic and educational background. Within the limitations of statistical analysis of performance, attempting to measure the gap between various groups of Black students and their English-speaking counterparts is important in order to highlight the practical implications of the current hegemonic structures, reflected by the exclusive use of English as an official LoLT.

In **Chapter 7** I present the results of my preliminary investigation and language attitudes survey. I reflect on classroom observation and exploratory interviews with the students in order to understand the problems speakers of an African language experience in the classroom. Using three questionnaires I explore the differences in language attitudes between various groups of students.

The differences between EL1 and EL2 Black students proved to be particularly interesting in deconstructing linguistic hegemony. Data from the questionnaires also contributed to shaping my intervention, discussed in Chapter 8.

In **Chapter 8** I describe the three phases of my intervention. Consistent with the action research approach, I highlight how feedback and lessons learnt in each phase informed the following one. I discuss the process of developing both the content and the Web-based delivery system for additional teaching material to support the learning of Computer Science partly in African languages. The final product, developed by a multidisciplinary team within the SANTED programme, took the shape of a glossary of English computer terms translated, explained and exemplified in isiXhosa. This was integrated into the e-learning course used by students of Computer Skills within the Rhodes Science Extended Studies Programme. The application was instrumented to inform research by collecting data on usage and allowing students to provide ample feedback. A reworked version of the language attitude questionnaire was administered at the beginning and at the end of the year to measure language attitudes shift. Given my emphasis on countering hegemony and the limited scope of my intervention, this seemed a more reasonable indicator of success than improvement in students' marks.

In **Chapter 9** I discuss my findings, linking them to my theoretical framework and drawing some general conclusions. I then outline future development and implementations of the glossary used as part of my research and suggest related topics for future research.

CHAPTER 2: POWER, DISCOURSE AND ATTITUDES

The purpose of this chapter is to define the key concepts I use in my research and the relationships between them. Power relationships in a post-colonial tertiary education context are the key issue. Building on Gramscian theory, I explore the concept of hegemony and link it to cultural and linguistic dependency. To a large extent, hegemony is enacted by powerful elites through control of the academic discourse and of language planning. In a democratic society, the latter needs to take into account the language attitudes of the portion of population affected by such policies.

2.1 Issues of power in education

In this section I explore how power dynamics in social relations are enacted in the education system. I start by describing Gramsci's view of education as a tool for the reproduction of power structures, and place it in the context of post-colonial education in Africa. I then highlight the crucial role played by language with respect to this and the relationship between linguistic and academic dependency. I pay particular attention to the role of Gramscian organic intellectuals as agents of social change, and suggest the embodiment form they might take in a post-colonial African university context.

2.1.1 Gramsci and the concepts of hegemony, praxis and organic intellectual

The Italian philosopher Antonio Gramsci (Gramsci, Hoare and Nowell-Smith 1971) challenges the ideologically constructed image of the education system as the *locus* for the redistribution of socio-economic power, and replaces it with that of a tool manipulated by powerful elites in order to maintain their hegemony[2] over dominated groups. According to Gramsci, hegemony is a form of control which rests on ideological, cultural and psychological domination rather than coercion. Elites manage to impose beliefs and world views which reproduce and reinforce existing power

[2] H**egemony** (pronounced hə'jemənē or 'hejə,mōnē) (Greek: ἡγεμονία *hēgemonía*) is the dominance of one group over other groups, with the implicit threat of force, to the extent that, for instance, the dominant party can dictate the terms of trade to its advantage (Wikipedia 2008).

structures by controlling social institutions, such as the church, the media, the legal system and the education system.

While the term i*deology* commonly refers to a system of ideas or world views, Purvis and Hunt (1993) note that, within Marxist theory, the concept assumes a slightly different meaning. These authors emphasise the importance of the consciousness people have of their conflicting interests, and of their representation within different world views. The underlying assumption is that there is a distinction between the way conflicting social interests can be identified and the way they are experienced. In other words, the term ideology refers to the different ways reality can be represented to suit the interests of a particular group. For example, it is in the interest of dominant elites to present a view of the education system as an objective, impartial "machine" where everybody, whether rich or poor, have the same chances of success depending on their merit. While this ideologically constructed view legitimates the power of highly educated members of the elite itself, it does not necessarily correspond to reality, and different interpretations are possible.

Gramsci defines the relationship between ideology and hegemony as dynamic. As pointed out by Green (1990:93), "A hegemonic order represents a temporary settlement, the ideological balance in favour of the ruling class, not the homogeneous substance of an imposed class ideology." Dominant ideologies are constantly challenged, and the ruling class must actively ensure they are accepted by the dominated groups in order to maintain power. This is a crucial point in my argument, as it implies that hegemony (linguistic and otherwise) rests on its acceptance by those who are subordinated by the ideology.

Within neo-Marxist theory, the practices which support a particular ideology, thus reproducing or challenging existing power structures, are referred to as *praxis* (Fischman and McLaren 2005). In Gramsci's view, the education system is the "fundamental apparatus of hegemony" (Borg, Buttigieg and Mayo 2002:6); existing power structures reproduce themselves primarily through education. In classroom practice, the dominant ideology expressed by the teachers is, to some extent, imposed on the students. This is done both overtly, by designing a curriculum and choosing teaching methods which advantage middle-class students, and covertly, by selecting for success those students who conform to middle-class values.

A common critique of Gramscian educational theory (and of critical pedagogy which, as discussed below, was partly inspired by Gramscian theory) is that it does not have a place for democratic participation of students in shaping their own education (Knight and Pearl 2000). Consistent with the idea, central to the concept of hegemony, that power relationships rest on their acceptance by subordinated groups, students play an active role in supporting the dominant ideology. On the one hand, they internalise the values passed on to them in order to adjust to the system. On the other hand, they bring aspects of their own cultural background (e.g. understanding of authority, value of intellectual vs manual work) into their responses to the demands of formal education. Such a response, as well as its effectiveness, is determined by a students' orientation towards embracing the dominant ideology as a way to escape their subordinate condition (Jones 1989). Education (and particularly higher education) has a crucial role to play in forming organic intellectuals, as shown by Gramsci's own personal experience. Therefore, in Gramsci's dynamic view of hegemony, education (particularly at tertiary level) has both a repressive and a transformative potential. The university is at the same time the *locus* for the enactment and deconstruction of hegemonic power relations, as well as the arena for confrontation between dominant and emerging ideologies.

A second critique often made to Gramscian theory (and to critical pedagogy) is its reactive character, i.e. its emphasis on criticising the *status quo* without providing alternatives (Biesta 1998). As part of his philosophy of praxis, Gramsci attributed to the education system the moral responsibility of bringing about a new social order. In the process of social and ideological transformation, he emphasises the crucial role of what he calls *organic intellectuals.* These are individuals who belong to the working class and, through formal or informal education, acquire the means to shape new and alternative ideologies (McLaren et al 2002).

Although Gramsci's ideas were developed in response to a particular political and historical context (i.e. the rise of fascism in Italy before the Second World War), they had far-reaching implications and influenced later schools of thought. Critical pedagogy emphasises the political character of education, and commits itself to social transformation in the interest of democracy and social justice (Aronowitz 2005; Giroux 2005). In practice, this translates into a critical analysis of unequal social relations and the way they affect and are affected by the education system (Biesta

1998). Originally concerned with differences between social classes, in the 1990s critical pedagogy found new applications with gender, race and language issues in education. In particular, its emphasis on culture, language and power relationships makes this pedagogical paradigm still relevant to education in post-colonial Africa (Lin and Martin 2005; McLaren and Farahmandpur 2005; Newstead 2008).

According to Mazrui (2002), Africans who are proficient in former colonial languages perform better in education and therefore achieve a dominant role in society. This contributes to keeping members of the elite, more Westernised and more proficient in such languages, in power. In South Africa, the situation is complicated by the fact that 21.5% of the population is made up of speakers of the colonial languages, English and Afrikaans (Statistics South Africa 2001). In education, these individuals are advantaged over speakers of an African language by the fact that their languages are the main LoLT. The use of languages in which they are not fully proficient excludes masses of African people from secondary and tertiary levels of education.

Partly through education (and particularly higher education) a portion of the African population is in the process of acquiring more and more political and economic power, and can be seen as an emerging elite. Like Gramscian organic intellectuals, African university students are in a prime position to challenge the dominant ideology and develop original counter-discourses. Most of them are by definition native speakers of an African language, but, as discussed below, are arguably more Westernised and more proficient in English and/or Afrikaans than the rest of the African population. However, it is debatable whether this allows them to compete on an equal footing with native speakers of English and Afrikaans in education (Heugh 2000). Acceptance of the *status quo* by those who are in a subordinate position is a key component of Gramsci's concept of hegemony. In African post-colonial education, this is closely linked to cultural dependency on the West and linguistic dependency on former colonial languages.

2.1.2 Cultural, academic and linguistic dependency in post-colonial African education

In post-colonial Africa, global forces and power relations have led to *cultural dependency*. This term is commonly used in dependency theory and comparative education (Arnove 1980; Woodhouse 1987), and it refers to the widespread reliance in developing countries on knowledge produced in the West. The underlying assumption is that Western culture is superior and intrinsically better, and that the knowledge it produces is universally relevant. This was part of colonial ideologies, but its legacy lingers on in post-colonial Africa. In the academic context, it is at the same time a reflection of existing global power structures and a powerful mechanism to reproduce such structures. In this sense, cultural and academic dependency can be seen as direct manifestations of hegemony.

Alexander (2001) calls on universities to take the lead in the process of social transformation in Africa, as they have both a prominent status and the necessary flexibility for change. Most importantly, they carry the responsibility of forming young African intellectuals. Like Gramsci's organic intellectuals, many of these individuals share the same background with the majority of the population and are in a prime position to spearhead an alternative ideology and a counter-hegemonic discourse. However, Alidou and Mazrui (1999) note that post-colonial universities can have alienating effects on their Black students; as a result of academic dependency, these institutions have been shaped on Western models. These authors argue that the African university, for example, is so uncompromisingly alien in the African context and has been transplanted with few concessions if any to African cultures. Its impact therefore has been more culturally alienating than it might have been. A whole generation of African graduates has grown up despising its own ancestry and scrambling to imitate others (Alidou and Mazrui 1999:113).

These authors note that cultural dependency is thus reproduced in the education system, whenever Black students struggle to imitate and reproduce the Western models they have acquired. Language plays a crucial role: in order to master the major intellectual paradigms of the West, which still dominate African and international academic discourse, an African intellectual must be proficient in a European language. Those students with lower levels of proficiency in the former colonial languages are *de facto* excluded (or at least discouraged) from taking part in academic debates. However, their contribution is possibly the most relevant for Africa-centred knowledge, as

they can offer the critical assessment necessary to better adapt Western knowledge to the African context (Alidou and Mazrui 1999).

Alidou and Mazrui (1999) note that, in most cases, those Africans who succeed academically go through a Western-style education system and assimilate typically Western ways of thinking. Proficiency in a former colonial language is not an additional skill for African graduates, but the only way for them to express their knowledge. Therefore, academic discourse in Africa can only be carried out in such languages. This supports cultural dependency at the ideological level, by setting the terms of discourse in favour of the West and preventing the emergence of counter discourses. For this reason, "intellectual dependency in Africa is perhaps inseparable from linguistic dependency" (Alidou and Mazrui 1999:114). Thus the use of English and/or Afrikaans as LoLT in South African universities can be seen as one of the factors contributing to the exclusion of potential organic intellectuals from the African population.

Ansre (1975) argues that proficiency in English is more beneficial to university students who are members of the elite and are characterised by a more international orientation than those from a more humble background. According to the view expressed by Ansre, the use of English as the main LoLT might contribute to alienating African university students from the rest of the African population. With respect to this problem, Pattanayak (1986:vi) highlights a general tendency for individuals in post-colonial developing countries who undergo a Western-oriented education to support reliance on foreign countries (typically in the West) for the production of knowledge, and a focus on the global rather than the local context. This tendency can be seen as both reflecting and entrenching cultural dependency.

With reference to the language situation in South Africa, the tendency discussed in the previous paragraph entails an emphasis on proficiency in English rather than indigenous languages, support for monolingualism as opposed to multilingualism and disregard for the development of local African languages. The position of the emerging African intellectuals with respect to these three issues is discussed in the next chapter. Bamgbose (2004) argues that, in post-colonial Africa, members of Westernised elites, who are arguably more proficient in the former colonial languages, use both academic discourse and language planning and policy (particularly in education) to retain

their power. Academic discourse and language planning and policy are discussed in the following two sections.

2.2 Academic discourse

Control of the academic discourse by powerful elites manifests itself in the difficulties encountered by students from marginalised communities in coping with the demands of the academic context. Within the responses of tertiary institutions in South Africa, there seems to be an inherent tension between a potentially assimilative orientation (exemplified by the "access paradox" (Janks 2000) and the promotion of equal access for a growing number of Black students. Supporting the development of academic literacy is one of the strategies to give access to the academic discourse. This, however, does not challenge the current hegemonic structures, reflected in the relationship between English and African languages.

2.2.1 Discourse-based approaches to improving access

Within a critical pedagogical view of tertiary education as a tool for the reproduction of hegemony, in post-colonial Africa academic success can be interpreted as the extent to which students conform to the Western orientation which shapes the education system. This mechanism for the reproduction of hegemony actively marginalises many Black students, who are not familiar with the culture and the languages most valued in the academic context. The ideologically constructed way their underachievement is explained and conceptualised plays a crucial role in determining the acceptance of the *status quo* by those students who are excluded or disadvantaged.

With specific reference to South Africa nearing the end of apartheid, Bradbury (1993) noted that identifying the difficulties experienced by many Black students as language problems could be seen as an ideological construction to avoid Apartheid-related ideas of innate differences in cognitive ability. In other words, blaming the underachievement of students from a marginalised background on lack of English proficiency offered a quick and politically correct explanation.

Boughey (2002) dubs this view as commonsensical and argues in favour of a more holistic, discourse-based approach. She disputes the centrality of language issues, when understood in a narrow sense, and argues that members of marginalised communities are not familiar with the academic culture (see Ballard and Clanchy 1988:6), and struggle to master the set of rules, values and practices that are valued in the academic context. This translates into underachievement and, in the worst-case scenarios, dropping out. Within this approach, intervention should focus on academic literacy, i.e. on enabling students to participate in the academic discourse. Gee (1990:143) defines discourse as

> a socially accepted association among ways of using language, of thinking, feeling, believing, valuing, and of acting that can be used to identify oneself as a member of a socially meaningful group or 'social network' or to signal (that one is playing) a socially meaningful 'role'.

Academic discourse is identified as a secondary discourse which all students need to acquire, and it is different from the primary discourse they are exposed to at home. Within this approach, emphasis is put on fostering academic literacy and familiarising the students with the norms and values of the academic discourse of their intended field of study. Students' background and past literacy experiences are taken into account, since they can either facilitate or impede the acquisition of academic literacy.

Adjusting to and mastering the academic discourse, which is a precondition for academic success, depends on students' past experiences within their family and home environment, i.e. their primary discourse. A print-rich home environment, where reading and critical discussion are encouraged and where discipline and hard work are emphasised, equips middle-class students with skills and values which are important at university. By determining what these values are, powerful elites are able to control access to tertiary education and facilitate the entry of members of their group while disadvantaging others. For historical reasons, in South Africa the academic discourse was shaped by English and/or Afrikaans-speaking members of the White elite. Unfortunately, the primary discourse of most students from a marginalised background does not prepare them equally well for the academic context, and does not support their acquisition of the relevant secondary discourse.

Many Black students struggle to “fit in” at university and resort to what Gee (1990:150) calls “mushfaking”, i.e. trying to behave as a member of a particular group while still in the process of mastering that group's discourse. Within the “dominant” ideology, tertiary education is constructed as an empowering opportunity for Black students. It allows them to access quality education and compete with White students. Attempts to assimilate can therefore be seen as acceptance of the hegemonic structures which, ironically, support the educational advantage of the latter group.

The discourse-based approach is a powerful tool to explain the difficulties experienced by marginalised students in various parts of the World. However, it does not seem to point to any structural solution beyond assimilation. This is not surprising if one considers that this approach was developed within predominantly monolingual contexts (such as the United States, the United Kingdom and Australia), and with the education of working-class or immigrant children in mind (see Duff 2007).

In the case of South Africa, the assimilation of the Black majority into a Westernised middle class seems an unrealistic project, at least for the foreseeable future. The primary discourse of a vast portion of the population hampers rather than facilitates their acquisition of the academic discourse. Tertiary education is expected to cater for a growing number of Black students from a marginalised background, and universities are under considerable pressure to rethink their strategies.

2.2.2 Access paradox

As part of the process of transformation of tertiary education in South Africa, there is a tension between the need to provide access for students to powerful discourses while, to some extent, reshaping such discourses to fit the local context. The discourse-based approach discussed above responds primarily to the first need. It seeks to empower students by making the rules of academic discourse explicit. Critical literacy is typically part of such interventions. Language issues are often examined from a critical stance, highlighting hegemonic relationships in society and education. Students are encouraged to reflect on the power of English and the way it affects them (Janks 2000).

In this sense, critical literacy is part of critical pedagogy, as it responds to its three main *tenets*: being emancipatory, difference orientated, and oppositional (Wallace 1999).

The hegemony of English, although often problematised, is seldom challenged in practice, and the covert goal of tertiary education seems to be the total demise of African languages, at least in the academic domain. This is consistent with the fact that, historically, tertiary education in South Africa was designed to cater mainly for native speakers of English and/or Afrikaans. The strong emphasis on the importance for many Black students of acquiring English proficiency and mastering academic literacy (in English) are consistent with the dominant ideology and reinforce linguistic hegemony. In this context, critical thinking and unveiling of power relationships in education can hardly be seen as empowering, but is rather exposing students to a harsh reality of linguistic and academic disadvantage.

Janks (2000) emphasises the interdependence between domination, access, diversity and design approaches within critical literacy. She highlights what Lodge (1997) calls the *access paradox,* i.e. the fact that providing students with access to powerful discourses maintains their dominance. According to Janks (2000), in order for interventions to be effective, deconstruction of dominance and provision of access must be coupled with the promotion of diversity as a value and involvement in designing alternative scenarios. In other words, it is not enough to unpack and provide access to the dominant discourse. The different discourses students bring to the university should be valued, and the creation of alternative discourses should be encouraged.

As correctly pointed out by Boughey (2002:295), most current interventions could be seen as remedial strategies responding to the shortcomings of education at lower levels, rather than occasions for institutional transformation. In order for interventions to be effective, a radical shift in both the conceptualisation of the issues and the practical efforts to address them is necessary. The promotion of the students' mother tongue at the institutional level has a crucial role to play with respect to this. This calls for serious rethinking of the current language-in-education policy and its relationship with the multilingual reality and educational experience of many Black students.

2.3 Language policy and planning

In this section I explore how hegemony is realised through language policy and planning. Throughout this section, I emphasise the legacy of Apartheid at all levels of education, and its impact on tertiary education today. I highlight the tension between theory, policy and practice, as this is the space where an alternative discourse can develop. I then discuss the development of African languages for use in the academic context. I focus particularly on the development and implementation of new terminology.

2.3.1 Language theory, policy and practice in South Africa

In this subsection, I highlight the discrepancy between theory, policy and practice regarding language in education in South Africa. I refer mainly to schooling (primary and secondary), since experiences at this level determine both the chances of Black students to continue their studies at university level, and their attitudes towards language-in-education issues which, as discussed in the next section, play a crucial role in supporting language policy. I emphasise the fact that the current English-medium policy adopted in most rural and township schools was *not* the result of pedagogical considerations, but a reflection of hegemonic relationships in Apartheid society.

The powerful elites who shaped language policy and planning in Apartheid South Africa were mainly native speakers of European languages, namely English and Afrikaans. As far as language-in-education policy is concerned, Bantu Education, the education policy for people classified as "Black" in the Apartheid era, coupled an impoverished curriculum and severe underfunding of Black schools and universities (Fedderke, de Kadt and Luiz 2000; see also Wright 1996) with a strong emphasis on mother-tongue education.[3] As a result, instruction in their mother tongue did not benefit speakers of an African language in the way it benefited speakers of English and/or Afrikaans.

[3] Under Apartheid, Black students would learn in their mother tongue in the first phase, and in English and/or Afrikaans afterwards, Ironically, at the time, South Africa was the only country in Africa to implement the recommendations of an UNESCO resolution (UNESCO 1953) suggesting that the mother tongue of the learners should be used at least for the first phase of education.

Black students were denied meaningful access to English and Afrikaans, both as LoLT and as second languages. This condemned them to linguistic inferiority, in both their mother tongue and the dominant languages of their society (Kamwangamalu 2001:393). This prevented many Black students from accessing tertiary education, thus relegating them to a subordinate role in society compared to White speakers of English and Afrikaans. This was realised through a school language policy which hampered the linguistic and academic development of Black students.

Early transition to (mainly) English as the sole official LoLT in school disadvantaged Black students and reduced their chances to access university. Mahlalela-Thusi and Heugh (2002) criticise the shift to English as the sole official LoLT in Grade Five. These authors looked at the transition between the first phase of Bantu Education (when African languages were used for the first eight years of schooling) and the second phase (when the years of mother-tongue instruction were reduced to four). Mahlalela-Thusi and Heugh found that, as a result of the transition, there was a drop in the pass rates for matriculation exams (which were written in either English or Afrikaans throughout). These findings suggest that, within the context of EL3 schools, the earlier a student started using English as the sole LoLT, the worse his or her Matric results would be. Paradoxically, the changes in language policy in response to the Soweto uprising of 1976 further disadvantaged speakers of an African language.

The legacy of Bantu Education lingers on in the New South Africa, reproducing the same power structures it was originally designed to enforce. The model for the education of Black children, i.e. early transitional bilingual education (a reaction to Bantu Education), has remained virtually unchanged since 1979. Most Black children in rural and township schools are officially taught in their mother tongue up to Grade Four, and in English thereafter. Walters (1996:215) argues that pupils are not trained in English well enough to use it as LoLT before the shift takes place. Writing pre-1994, MacDonald (1990) also argued that the shift happened too early. She noted the discrepancy between the vocabulary of English words pupils had learnt by the end of fourth grade (800) and that required for fifth grade (5 000). She argued that low standards and high drop-out rates in many Black schools might be due, among other things, to the early transition to a LoLT with which many learners were not familiar.

The difficulties experienced by speakers of an African language can be explained in terms of the psycholinguistic theory concerning the relationship between first and second languages in education elaborated by Cummins (1986). This distinguishes between "basic interpersonal communicative skills" (BICS) and "cognitive/academic language proficiency" (CALP). Cummins claims that the two languages of a bilingual can develop independently up to the BICS level, but at the CALP level they work interdependently. This means that, in a decontextualised and cognitively demanding situation (such as higher education, for instance), the level of CALP in the second language depends on its stage of development in the first language. A failure in the development of CALP in the first language inhibits the acquisition of academic language skills in the second language. This is known as the interdependence hypothesis. With reference to studies in the South African context, Luckett (1995:75) notes that

> Many Black pupils could not explain in English what they already knew in their first languages; nor could they transfer into their first languages the new knowledge that they had learnt through English. In other words, they found that pupils had failed to achieve CALP in either language.

More recent studies (Setati and Adler 2000) seem to suggest that Black students *do* use their mother tongue for exploratory talk and conceptual discourse in mathematics. The above paragraph could therefore be reinterpreted as indicating that students had in fact achieved CALP in their mother tongue, but their poor English proficiency did not allow them to either explain their knowledge or fully grasp what they had learnt in English.

Baker and Jones (1997) discuss Cummins's theory, highlighting that instruction through the home language does not prevent the development of academic proficiency in a second language. On the contrary, according to the interdependence hypothesis, once academic proficiency is developed in one language, it can be transferred to another, given enough motivation and exposure to the target language. Sweetnam-Evans (2001) notes that bilingual learners who are not taught entirely in English are likely to have higher levels of English proficiency than those who are taught only in English, provided that they have opportunities to practice it. Using English as the sole LoLT, on the other hand, does not necessarily improve one's proficiency in it (Thomas and Collier 1997).

The South African example shows that a language policy (and, perhaps most importantly, its implementation) favouring the use of English as a LoLT does not guarantee higher levels of English proficiency. Since 1979, most African children have been officially taught only in English from fourth grade onwards. In spite of this, according to Webb (1996:178), less than 25% of the South African Black population has a reasonable competence in English. Gough (1996) quotes a number of other studies on English proficiency among Black South Africans, with figures (depending obviously on the definition of *proficiency*) ranging from 61% (SABC 1993:27) to 32% (Schuring 1993:17). Although these figures refer to research conducted over a decade ago, to my knowledge little has changed in the education system (see Heugh 2002; Howie and Plomp 2003), nor is there a clear indication of an increase in English proficiency among speakers of an African language.

Low English proficiency in Black schools can be explained by a number of factors. In some cases, teachers themselves (most of whom have been trained under Bantu Education) are not necessarily proficient in the language (Webb 1996). Especially in the rural areas, most children have little contact with English outside the school. The classroom is the only domain where students are exposed to English and have a chance to practise it. Code-switching in the classroom is often blamed for low levels of English proficiency. Setati and Adler (2002) speculate that this could explain why teachers in rural areas express particularly negative attitudes towards code-switching. Until there is a profound transformation in the South African society and in the redistribution of educational resources, many Black students will be unable to achieve proficiency and cope with instruction in English by the time they reach university.

Various government bodies (NCHE 1996, PanSALB 2001; CHE 2001) acknowledge the importance of promoting the role of African languages at all levels of education, including the tertiary level, to tackle language problems. The contentious nature of language planning in South Africa is exemplified by the debate around the development of African languages for use in the academic context, discussed in the following two subsections.

2.3.2 Language planning

In this subsection I provide some historical background on language planning in South Africa. The fact that decisions concerning the development of African languages have, for a long time, been taken by members of the White elite has led to the marginalisation of such languages. I highlight how this impacts on the use of African languages in the academic context today. In spite of some clear linguistic advantages of African languages over English, the difference between various spoken varieties and the written standard, the politically motivated rivalry between speakers of mutually intelligible languages, the lack of appropriate terminology and of support among their own speakers are arguments used to perpetuate the exclusion of African languages from the academic domain. In stark contrast, Afrikaans is an example of a language which, through appropriate planning, has developed from a dialect to a fully technicalised language, suitable for every purpose in society. Some argue that now similar effort should be put into the development of African languages (see Luckett 1995).

As pointed out by Fettes (1997), language planning refers to any structured, coherent and explicit attempt to define the role a language should play in a given society. This is done by planning its development, status and envisaged use in various domains. Paulston and McLaughlin (1994, cited in Fettes 1997:14), emphasise the strong link between language planning and education when they state that "all aspects of language planning are potentially relevant to education, and vice versa". The use of African languages in the academic domain includes both corpus and status planning.

Corpus planning deals with issues of standardisation and development of a language's vocabulary. Scholars (see Haugen 1966; Crystal 1993; Fettes 1997; van Huyssteen et al 2003) outline four components of corpus planning. Although there is little agreement on the terms used and the boundaries between the various phases (see van Huyssteen et al 2003:37), these are: graphisation (i.e. the development of a writing system), standardisation (i.e. the choice of a common "norm"), modernisation (i.e. the development of new terms, also known as technicalisation), and implementation (i.e. its actual acceptance and use by speakers of that language). Although all components of corpus planning have implications for the use of African languages in tertiary

education, modernisation and implementation are probably the most important for the purpose of my study.

For many African indigenous languages, graphisation covertly included what in Haugen's (1966) and Crystal's (1993) models of language planning is termed *selection of the norm*, which is usually part of standardisation. Indigenous South African languages have been standardised in relatively recent times (see Smit 1996): Christian missionaries used the Latin alphabet to put in writing the varieties spoken in the areas where the missions were situated. This had three sets of consequences, all of which impact on the use of African languages in tertiary education today.

First of all, African languages have a phonetic spelling, i.e. the way words are written corresponds quite accurately to the way they are pronounced. Arguably, this makes it easier to acquire basic literacy in any of these languages than in English. The second consequence of the standardisation process is that different groups of missionaries wrote in different ways that, from a linguistic point of view, were a continuum of dialects of the same language (see Smit 1996:58-59). Within the two main families – Nguni (i.e. isiXhosa, isiZulu, isiNdebele and siSwati) and Sotho (i.e. Sesotho, Sesotho sa Leboa and Setswana) – many indigenous South African languages are mutually intelligible.

The third, and possibly most important, consequence of the process of standardisation is that standard varieties were selected randomly by the missionaries. Contrary to the norm (see Webb and Kembo-Sure 2000:10), the variety chosen as the reference was not necessarily the dominant or the most widely spoken one. This made it difficult to impose it as the standard, and created communication problems between speakers of different varieties of the same language.

The choice of a variety as the standard is important because of the perceived benefits for speakers of that variety, and the marginalisation of speakers of less prestigious ones. Herbert (1992) highlights the potential for intergroup tensions, especially when the standard variety is chosen as a national or official language and is supposed to function as a symbol of national identity. The random way in which the standard varieties of African languages were chosen might account for the difficulties some of their speakers find in using them in education in general, and in tertiary

education in particular. When speakers of different varieties of the same language come into contact at university, it becomes apparent that some of them are not as familiar with the official written standard as others, and that its use would further disempower such students compared to other speakers of the same language.

Particularly for use in the academic domain, a language must have appropriate technical terminology. Under Apartheid, development of the African languages was often informed by the interests of the government rather than those of the relevant language communities. New terms were developed simply to support the facade of official status in the former homelands (van Huyssteen et al 2003:48). The result was general poor quality of the terminology developed, which might account for the difficulties in promoting the use of new terminology in the African languages. In order to support the use of African languages in the academic context, intervention is needed to develop new terminology and to promote its actual use. These two key issues are discussed in the next subsection.

2.3.3 Terminology development and implementation

In this subsection I discuss various strategies for the development of terminology in African languages. One of the key issues is to strike a balance between the use of borrowings from European languages (mainly English) and the development of new terms. The creation of new terms in African languages has both practical and ideological implications. The actual implementation and acceptance of such terminology in the academic context, however, depends largely on the attitudes of speakers of African languages themselves.

According to van Huyssteen et al (2003:7), the most common strategies of word creation in African languages are borrowing, compounding and derivation. African languages are following the same path as other languages (see Pulcini 1995 for an example with Italian), and more and more English borrowings are used, especially in the scientific and technological field (Setati et al. 2002). This can allow for the lexicon to grow fast, in the same way the English lexicon grew by borrowing existing scientific and technical terms from other languages. Similarly, English borrowings are

extensively used in code-switching by speakers of an African language at all levels of education (Setati et al 2002). These borrowings are nested within the grammatical structure of African languages (Simango 2000). In other words, while the terminology may be of mixed origin, deeper linguistic structures are organised according to the students' mother tongue.

Many African languages are descriptive and idiomatic, which makes it easy to create new words by combining existing ones. This strategy for word creation is called compounding. New technical terms created in this way are arguably very suggestive to native speakers, as they link to the existing "semantic clouds" of related words. The morphology of many African languages also makes the creation of words by derivation easy. By changing the prefix, a root acquires different meanings. The advantage is that, once someone meets a new word with a known root, he or she immediately knows which other words it is semantically related to. In scientific academic discourse, this makes categorisation easier by highlighting the semantic links between words (Halliday and Martin 1993).

Research on language attitudes (see Barkhuizen 2001, Dyers 1998) has indicated a preference of high school and university students for a "purist" approach to the technicalisation in African languages. This could be seen as part of the legacy of Apartheid's ideologically constructed idea of language purity. As we now know, this was designed to isolate Black South Africans and marginalise African languages and their speakers. Contact and mutual borrowing are in fact a more "natural" way for languages (and cultures) to develop (Kamwangamalu 2008). This is demonstrated by the fact that many of the English terms commonly used in the academic context are of Latin or Greek origin. Madiba (2001:18) stresses the importance of communication and advocates a pragmatic approach, which "has the capacity to open up the African languages for new terms through borrowing and at the same time, to enable non-specialists to understand the relevant concepts as they are designated by indigenous terms of their languages".

Crystal (1993) calls *implementation* what in other models (see Haugen 1966) is referred to as *acceptance*. This essentially refers to the phase in which terminology is made available, and is either adopted or rejected by speakers of the target language. Haugen (1966:349) highlights the interdependence between the different phases of language planning, and emphasises the importance of acceptance at the ground level for language planning to be effective. This means that

development of new terminology must necessarily be informed by the processes of implementation and acceptance.

In the New South Africa, implementation is coordinated by the Pan South African Language Board (PanSALB).[4] While the quality of the terminology developed and/or certified through these bodies is of a high standard, the process is often slow. Also, because of their generic purpose, these bodies do not always have in-house expertise in certain subject areas, and need to rely on external sources. Reliance on more dynamic bodies, such as universities, for instance, could bring in a variety of expertise and make the process more dynamic. Involving speakers of the relevant languages who are also university students would also constitute an example of the democratic and "bottom-up" approach formally supported by government policies (LANGTAG 1996). This, in turn, would open the space for a dynamic relationship between the dominant ideology expressed by government bodies and alternative ones, supported by informed members of the language community.

In recent years, various non-governmental projects have sprung up to spearhead the development and implementation of terminology in the African languages, such as PRAESA and Translate.org.za, for instance. By focusing on particular areas, such projects are able to follow all steps of corpus planning, from terminology collection and creation to implementation, thus contributing to the intellectualisation of African languages.

According to Fettes (1997), a language must be prestigious and enjoy high status in order to be used in education. This underpins its use in a high-status domain, such as the study of an economically empowering subject at tertiary level. One of the main obstacles to such a use for African languages is the association in the minds of many African university students of their language with traditional and low-status domains. I believe that, at this stage, practical intervention should aim mainly at improving language attitudes towards the use of African languages. Support from their speakers can make a significant contribution towards the development and implementation of terminology and, on a wider scale, to their use as LoLT in tertiary education.

[4] The Pan South African Language Board (PanSALB) is a Subcommittee of the Senate concerned with the protection of linguistic diversity and language rights. It functions both as a watchdog on the implementation of language policy and as an advisory body for the government.

2.4 Language attitudes

In this section I discuss language attitudes and their dimensions. In particular, I focus on their relationship with motivation and with ideology, highlighting their complex and dynamic nature. In the examples, I draw on research conducted mainly in the Eastern Cape, where my own research was conducted.

2.4.1 Definition

A working definition of *language attitude* accepted by most authors in the field (Baker 1992; Edwards 1994:97-98) is "a disposition to respond favourably or unfavourably to a language". The implicit and covert nature of attitudes makes their relationship with overt action problematic. There can be (and often is) a discrepancy between what people feel and think, what they say and what they actually do. A number of factors such as self-perception, self-presentation and self-justification play an important role in determining one's behaviour. Language attitudes might be influenced by external factors of which an individual is not consciously aware. An example could be internalised and accepted dominant ideologies within hegemonic structures. An alternative (or possibly concurrent) explanation is that discrepancy between expressed attitudes and behaviour is the result of contrasting attitudes within an individual.

Edwards (1994) notes that members of a language minority who have achieved high status in their society are the most likely to support the promotion of their mother tongue, though they rarely use it in practice. A possible explanation is that members of this group already enjoy the advantages offered by proficiency in the dominant language, and favour promotion of their mother tongue as part of their identity. Marginalised individuals, on the other hand, seem to be more vulnerable to the power of dominant languages and to linguistic hegemony. As a consequence, they are the most likely to display negative attitudes towards their own language, associated with their subordinate position, in favour of the dominant one.

The discrepancy between expressed attitudes and action is evident in the case of the emerging Black middle class in South Africa. Many members of this group seem to support the promotion of

their mother tongue in principle, but actively prefer using English when given the chance. This dichotomy can be understood in terms of what Gardner and Lambert (1972:14) call instrumental vs integrative orientation towards a language. This is similar to the distinction made by Heine (1992) between two different functions of a language, i.e. vertical and horizontal. The former refers to the "usefulness" of a language as a tool for upward mobility, a role which for most Black people is fulfilled by English. The latter refers to the value of a language as a symbol of social identity and a tool of intergroup communication, and is typically associated with African languages.

Peirce (1995) criticises these static views, and introduces the concept of *investment,* which draws on Bourdieu and Passeron's (1990) metaphor of *cultural capital*[5]. In learning a new language, a learner needs to strike a balance between the material or symbolic advantages of the cultural capital a language gives access to and the effort of learning that language. This goes beyond instrumental or integrative motivation as static personality traits, and captures the dynamic relationships within an individual and 'attempts to capture the relationship of the language learner to the changing social world, it conceives of the language learner as having a complex social identity' (Pierce 1995:17). Although this theoretical framework was developed for research on second language learning by immigrants, its emphasis on multidimensionality and dynamism offers some useful insights for my research. In modern South Africa, in fact, both English and their mother tongue are part of the social identity of Black students, and conflicting attitudes can coexist within the same person.

Pierce's model also accounts for the possibility of change in language attitudes as a consequence of power relationships in society. Under Apartheid, English played a symbolic role as the language of pan-African struggle against oppression (Reagan 1986; see also Webb and Kembo-Sure 2000). In recent times, however, a portion of the African intelligentsia is beginning to reject the supposedly neutral role of English, and realises its potential as a tool of linguistic hegemony (Gough 1996; see also African National Congress 1992). This could be seen as a realisation that mastery of English requires considerable "investment" by speakers of an African language, while this is obviously not the case with native speakers.

[5] According to these authors, different social classes have different knowledge and modes of thought, i.e. different cultural capitals, which have different value and "exchange rate". In this context, rather than social classes, cultural capital is linked to different language communities.

In the minds of most speakers of an African language, Afrikaans is associated with Apartheid's repressive policies. The fact that individuals previously classified as "Coloureds" now constitute the majority of Afrikaans speakers might change this perception. African languages are often associated with backwardness and marginalisation. In spite of this, the "African Renaissance" proposed by former president Thabo Mbeki is intended to boost the sense of pride of speakers of African languages, and is creating the conditions for a (limited) increase in their instrumental value (e.g. by making proficiency in one of them a requirement for certain jobs). Taken together these factors suggest that language attitudes have a much more complex nature than can be captured by two-dimensional analysis. They also point to the fact that external socio-political factors can influence and possibly change language attitudes. This is a crucial point in my research, and I believe education can make a key contribution with respect to improving attitudes towards African languages.

2.4.2 Language attitudes in education

In democratic societies language attitudes have an important role to play in shaping language-in-education policy (see Lewis 1981; Baker 1992; Edwards 1985; 1994; LANGTAG 1996; Heugh 2000). Policy-makers are therefore faced with two sets of challenges, relating to the nature of attitudes outlined above. On the one hand, they must capture the complexity of the model people have in mind for the possible relationship between English and their mother tongue. On the other, they must respond to shifts in language attitudes by reshaping and adapting existing policy. As part of the latter, I would argue that an effective policy should not only be responsive to requests "from the bottom", but pro actively encourage the use of African languages in high-status domains such as Science and Technology education at tertiary level.

Webb (1996) claims that most African parents prefer English as opposed to an African language as a LoLT for their children in primary school, mainly for instrumental reasons. A study of isiXhosa-speaking parents who sent their children to English-medium schools in the Eastern Cape (de Klerk 2000), identifies the main reasons as the poor conditions of Xhosa schools (a legacy of Apartheid) and the lack of real support for isiXhosa in education. De Klerk argues that, by the time

the necessary transformation has taken place in the education system, the isiXhosa-speaking elite will have shifted completely to English.

Heugh (2000:12-13) disputes the results of both studies. In the case of Webb's (1996), she notes that parents seem to demand increased access to English rather than substitution of the mother tongue with English as a LoLT. In the case of de Klerk's (2000) research, she points out that the parents considered in the sample, being part of an elite, cannot be considered as representative of the attitudes of the whole community. African parents who would opt for an English-mainly or English-only model for their children are therefore a minority. In the same period as Webb's study, Smit (1996) found positive attitudes among Black students towards the use of other languages (isiXhosa and Afrikaans) alongside English as LoLT.

According to Barkhuizen (2001), speakers of isiXhosa as a first language in Western and Eastern Cape secondary schools have positive instrumental attitudes towards English. However, in his study overall support for English was not as widespread as one would have expected, considering that by that stage of their education students were using only English as a LoLT. There was no clear indication of preference for an English-only policy at the expense of isiXhosa. According to Bekker (2002) analysis of research on language attitudes indicates that students have a more complex model in mind than can be captured by a clear-cut choice between English and their mother tongue as LoLT. The same seems to apply at tertiary level (Dyers 1998; Dalvit and de Klerk 2005; Aziakpono 2008).

In Barkhuizen's study, the majority of the learners thought that it was important to study isiXhosa, mainly for integrative reasons. This study confirmed the association of isiXhosa with low-status subjects such as Biblical Studies. This is consistent with research at tertiary institutions (Dalvit 2004; Aziakpono 2008), where students considered the use of their language more appropriate for less economically empowering subjects and for lower levels of education.

These studies highlight three crucial points concerning language attitudes in education in South Africa. First of all, the interpretation of findings depends on the ideological stand of the author. Heugh, coming from a more pro-African languages stand than Webb or de Klerk, clarified some of

the findings of their studies which could have been interpreted as favouring the use of English as the sole LoLT. Secondly, there is widespread confusion between access to English as a second language and its use as the sole LoLT. Students seem to have a more complex model in mind for the respective roles English and their mother tongue can play in education. Thirdly, for historical reasons, language is inextricably linked with quality of education. By expressing a preference for English as a LoLT, most people are actually referring to the high-quality education one can get in schools where English is taught as a first language. For the same reason, African languages are often considered more appropriate for low-status subjects and low levels of education. It is one of the assumptions in my research that educational research and interventions can play a major role in changing these attitudes.

Baker (1992) notes that attitudes can be both an input and an output of education. Positive attitudes towards a language, for instance, can contribute to a student learning it well. At the same time, attitudes can also be a result of education. While good performance develops a sense of self-efficacy and positive attitudes, underachievement can lead to frustration and low self-esteem. One could argue that the latter is the situation of many Black students faced with the linguistic standards required at university (de Klerk 1996). This adds a dynamic dimension to attitudes: they may change over time according to the circumstances (see also Smit 1996). It is reasonable to assume that the way an institution approaches speakers of an African language from a marginalised background and identifies their difficulties has a great impact on their attitudes.

2.5 Summary and conclusions

Hegemonic power relationships in society are enacted in the education system. Hegemonic relationships are dynamic, and acceptance of dominant ideologies by those who are dominated must be constantly renegotiated and reinforced. In a post-colonial African context, language plays a crucial role with respect to this. The use of former colonial languages reinforces cultural dependency on the West. It advantages Westernised elites who are arguably more proficient in such languages than the rest of the population. These elites have easier access to higher education and, therefore, to legitimate power. In the case of South Africa, the emerging Black middle class is in an ambiguous position, being more proficient than most other speakers of an African language, but less

proficient than native speakers. As this group acquires political and economic power, it might challenge the current English-functional ideology which dominates education.

Powerful groups manage to impose their ideology by controlling academic discourse as well as language planning. The way academic institutions identify and address the difficulties of students from a marginalised background can affect their language attitudes. These in turn affect students' performance. The most common approach at South African universities is to focus on academic literacy rather than language problems. The rules, values and conventions of the academic discourse are made explicit. Students are encouraged to reflect on language issues in education through critical literacy. In spite of this, the linguistic hegemony of English is seldom challenged in practice. Such an approach is remedial rather than transformative, and could potentially entrench the hegemonic power relationships which actively disadvantage most Black students.

Language planning and language policy in education are powerful hegemonic tools. This is particularly true in South Africa where, for historical reasons, language is strongly associated with status and social identity. The legacy of Apartheid's discriminatory policies still affects language planning in the African languages today. This hampers the effective implementation of language policy. The English-mainly official model, dominant in many rural and township schools, disadvantages Black children educationally and does not lead to English proficiency. Perhaps most importantly, it does not reflect the multilingual reality and educational experience of many speakers of an African language. This tension can be interpreted as a clash between the dominant, pro-English ideology and an alternative one.

In a democratic society, language policy and planning should take into account the language attitudes of all stakeholders. Language attitudes are influenced by social relations and power structures in a given society, i.e. they often reflect dominant ideologies. Like hegemony itself, language attitudes are dynamic and can change over time. Like Gramscian organic intellectuals, African academics are in a prime position to bring about social change. Shifts in their attitudes, possibly as a result of their educational experience, are particularly important.

CHAPTER 3: LINGUISTIC HEGEMONY OF ENGLISH

In the previous chapter I discussed the role of language as a hegemonic tool and its role in determining academic success. In this chapter I discuss previous research which took place over a period of time (and therefore under different political circumstances). Using a Gramscian lens, I draw on the results of this research to situate my own study.

I start by comparing the performance of students from different linguistic backgrounds. Analysis of academic performance shows that EL2 students are disadvantaged compared to EL1 students even in technical and scientific subjects. Nevertheless, language attitudes studies indicate that speakers of African languages have positive attitudes towards the use of English. However, such studies highlight potentially critical views and support for the use of African languages, especially among EL2 students. In the final section I discuss the lessons learnt from some attempts at using an African language in the academic context. I focus on the extent to which they challenged the dominant role of English in education.

3.1 Statistical studies

In this section, I analyse the impact of language on academic performance. Most studies using statistical analysis to determine the impact of different factors on performance focus on Science or Commerce subjects. In the first subsection I discuss the impact of language as opposed to other variables on performance. In the second subsection I focus on Matric results, comparing particularly the use of marks for English as opposed to marks for Mathematics as predictors of success.

These are small-scale studies carried out in contexts quite different from that of my research. In terms of gaining a better understanding of hegemonic relationships, which is one of my research goals, these studies consistently point to the importance of language in determining academic success. The strong correlation between language and other factors (i.e. educational, social and

economic background) makes it difficult to draw conclusive statistical conclusions on the impact of a student's mother tongue on his or her academic performance.

3.1.1 Factors affecting academic performance

In this subsection I discuss two studies which explore the impact of various factors on academic performance. Webb (2005) discusses the use of English as the main language to teach scientific and technological subjects in South Africa. A table taken from research he conducted among first-year students at the University of Pretoria (UP) has been rearranged to highlight the different performance of speakers of English as a first as opposed to a second language in different subjects.

Table 1: Percentage students per course registration who passed selected first-year courses in 1999 at the University of Pretoria, by language used as medium of instruction (MoI)

	L1 LoLT	L2 LoLT	Diff.
Traditional Law 110 (N = 679)	53	40	13
Information Science 111 (N = 583)	81	65	16
Psychology 110 (N = 1000)	74	57	17
Physics 131 (N = 575)	75	57	18
Statistics 110 (N = 1939)	68	45	23
Commercial Law 110 (N = 1001)	79	53	26
Private Law 110 (N = 634)	71	44	27
Public Administration 110 (N = 72)	73	45	28
Education 110 (N = 302)	71	34	37
Sociology 110 (N = 327)	80	40	40

Source: University of Pretoria Student Data Bureau

Students who are taught in their first language perform better than those who are taught in a second language. The difference in average pass rate varies considerably across subjects. Physics and Statistics, the two Science subjects, are in an intermediate position, but closer to the low-distance end of the continuum. The difference between being taught in one's first language as

opposed to a second language is not as significant in these subjects as it is, for instance, in Sociology or Education.

Language was the main factor determining differences in academic performance. Drawing on the discourse-based approach to increasing access to tertiary education for EL2 students, Webb's (2005) findings could be interpreted in terms of the discrepancy between the primary discourse of students who studied in a second language and the academic (secondary) discourse. It is important to note, however, that because of the linguistic composition of UP (Webb 2005:5), the table above concerns mainly the difference between speakers of English and Afrikaans from similarly privileged backgrounds.

Negash (2002) conducted a study on factors affecting the performance of Accounting students at Rhodes University in 1995 and 1996. She notes that although female students perform better than their male counterparts on average, this difference is not statistically significant. Race, on the other hand, correlates significantly with marks. Not surprisingly, Whites tend to perform better than non-Whites and have lower failure rates (10.7% as opposed to 32%). In the context of Rhodes, the distinction between Whites and non-Whites partly overlaps with the distinction between speakers of English as a first as opposed to a second language.

In examining these findings one must consider that Negash groups as “non-Whites” students from different social and educational backgrounds. South African Blacks, Indians, Asians, Coloureds and their non-South African counterparts all came from different school systems and arguably had different levels of English proficiency. While White South Africans perform better than White foreign students, this distinction is not significant for non-Whites. This seems to contradict the common belief that Black students from other parts of Africa, having supposedly better levels of English proficiency, perform better than their South African counterparts.

3.1.2 Matric results

The studies in this **subsection** explore the reliability of Matric results as predictors of academic success in various scientific and technical disciplines. Aggregate Matric results are better predictors of students' academic performance than results for any single subject (Campbell and McCabe 1994; Dambisya and Modipa 2004). Students who are high achievers, no matter their background, have obviously better chances of success at university.

Rauchas et al. (2006) explored the correlation between Matric results for Mathematics, English and (any) first language and results in first-year Computer Science at the University of the Witwatersrand. They found a weak correlation between Mathematics and first-language grades and Computer Science performance. On the other hand, they found that results for English, particularly when written as a first language, correlate significantly with students' results in Computer Science. Rauchas et al. (2006:400) challenge the current use of results for Mathematics in Matric as the main criteria to select students for Computer Science courses. Most importantly, they emphasise the importance of language, noting that

> Although we have argued for many years that students whose home language is not English should still cope well within mathematically oriented subjects, where, for example, essay writing is not prioritised, this is not turning out to be the case.

Rauchas et al. (2006) realise the importance of addressing the inequalities between first- and second-language speakers of English. Although technical terminology has to be learnt anew by speakers of English as a first and as a second language alike, these authors speculate that it is easier for native English speakers to learn new words. Apart from greater ease in looking up new terms in the dictionary, native speakers are more likely to be already familiar with, or make sensible guesses about, the meaning of such words. Technical terminology is also easier to remember, thanks to its connection with other known words (Rauchas et al. 2006:401). As noted by Campbell and McCabe (1994), Matric results for English seem to be a better predictor of success than those for Mathematics.

Negash (2002) notes that the influence of Matric results, particularly in English, Mathematics and Accounting, is statistically significant only for the first few years, and declines consistently over the years. Dambisya and Modipa (2004) support this claim. In their statistical analysis on the Pharmacy Foundation Programme at the University of the North (now University of Limpopo), they note that the level at which Mathematics was written in Matric (Higher or Standard Grade) correlates significantly with pass rates. As noted by the authors, the latter grade is an indicator of the kind of school a student attended, and is usually correlated with quality of education and availability of resources.

Good Matric results for English are a strong predictor of academic success, even in a technical subject such as Computer Science. This confirms the role of English as a hegemonic tool outlined in Chapter 2. As noted above, it is impossible to separate performance in English as a subject from a number of other factors such as type of school attended, which relates to socio-economic background. Having attended well-resourced EL1 schools seems to advantage speakers of an African language in their first year at university. In the next section I discuss how this relates to language attitudes, and to support for English as opposed to African languages as LoLT.

3.2 Research on language attitudes

As shown in the previous section, language plays a key role in determining academic success. In this section, I discuss the language attitudes of Black students at university level. I compare the attitudes of EL1 and EL2 students. As noted in the previous section, the latter group is disadvantaged in the academic context, partly because of lower English proficiency. My tentative hypothesis is that this translates into more negative attitudes towards the use of English.

Allowing for complexity in the responses reveals particular areas of support for the use of African languages. These areas generally reflect the association of African languages with low status domains. During my discussion I draw on four studies: de Klerk's (1996) research at Rhodes University, Dyers' (1998) PhD research at the University of the Western Cape (UWC), my own Master's research at the University of Fort Hare (Dalvit 2004; Dalvit and **de** Klerk 2005), and Aziakpono's Master's research at Rhodes University (2008). The four studies had different scope,

were conducted at different times, focused on different students and used different wordings for questions. Moreover, different researchers approached the issue from different ideological standpoints.

3.2.1 Support for contrasting ideologies

In this subsection I highlight the ambivalent position of speakers of African languages in relation to language issues in education. On the one hand, the dominant pro-English ideology entrenches the higher status of Black university students compared to the rest of the Black population. On the other hand, a pro-African languages counter-ideology would assert their equality with speakers of English and other powerful languages.

The students in all four studies referred to above were confident about their levels of self-assessed English proficiency. Roughly half of the respondents in all studies felt their English was good enough to cope with university studies, and an additional third felt their English was very good. Figures were similar for all four studies, although the actual English proficiency of students in the four samples was probably different. Confidence in English increased consistently over the years for all studies but de Klerk's (1996). Not surprisingly, Black students who attended EL1 schools reported higher self-assessed proficiency than EL2 students (Dalvit 2004; Aziakpono 2008). This probably reflects the actual difference in English proficiency between the two groups.

Attitudes towards English in all four studies were generally positive, mainly because of its instrumental value. Support for its use as LoLT from an early age was strong (approximately 90%), particularly among EL1 students. Such respondents were also less likely to believe that the use of English as a LoLT disadvantages speakers of African languages. Overall, EL2 students were more critical of the role of English in education (Dalvit 2004; Aziakpono 2008). Statistically, this was a comparatively weak attitude, supported by half of all the respondents, but it is a sign of acknowledgement of the linguistic hegemony of English.

In Dyers's (1998) study, students did not seem to challenge the dominant role of English as the sole LoLT, although support for it decreased from 70% in first year to 60% in second year. At the same time, both Dalvit's (2004) and Aziakpono's (2008) studies indicate that support for the use of isiXhosa as an additional medium of instruction increased over the years. This could be interpreted as a more critical attitude of students in later years towards the dominant role of English as a result of either their own experiences at the University, or their development as young intellectuals.

Self-assessed written and oral proficiency in isiXhosa was high (70 – 80%, see Dalvit 2004 and Aziakpono's 2008). Approximately three-quarters of both samples believed that standard isiXhosa was very different from the one they spoke. In both studies, this belief seemed to be relatively independent of either self-assessed proficiency or type of school attended. However, EL2 students had more positive attitudes towards their mother tongue and its development for academic use, which was supported by approximately three-quarters of all respondents.

3.2.2 Support for African languages in different domains

In this subsection I discuss the support for the use of the students' mother tongue in different domains. This highlights the link between language attitudes and ideology, discussed in Chapter 2. I start with a brief overview and some reflections on the overall support for African languages at different institutions. I then show how allowing for more detail reveals areas of support for the use of African languages in tertiary education (e.g. in tutorials, etc.). This, however, still reflects the dominant pro-English ideology, which relegates African languages to low status domains.

Overall support for the use of African languages vis-à-vis English was strikingly similar at the four institutions over the same period. It was comparatively low in de Klerk's (1996) and Dyers's (1998) studies, conducted shortly after the end of apartheid. In Dalvit's (2004) and Aziakpono's (2008) studies, a stronger pro-African languages orientation could indicate a shift in the ideological balance. Similar attitudes at institutions with very different linguistic composition suggests that attitudes reflected ideological orientation rather than being a response to practical considerations. If the latter were the case, one would have expected stronger support for the use of isiXhosa at Fort

Hare, where 80% of the student population speaks the language (see Dalvit 2004), than at Rhodes, where the percentage of isiXhosa speakers is close to 15% (see Aziakpono 2008).

While considering the possible challenges to the use of an African language in tertiary education, fear of possible tensions with speakers of other languages and of loss of English proficiency were the most prominent concerns, expressed by one-third of the respondents in Dalvit's (2004) and Aziakpono's (2008) studies. The belief that using different African languages would fuel tribalism entrenches the role of English as a *lingua franca*, equally disempowering for all speakers of an African language. The belief that using one's mother tongue would detract from English proficiency polarises the language issue as a clear-cut choice, in which the higher-status language prevails at the expense of all others. Formulating the debate around language in education as a clear-cut choice between an English-only and a dual-medium model is in itself ideologically loaded. Adding complexity to the picture revealed areas of possible support for African languages.

In both Dalvit's (2004) and Aziakpono's (2008) studies, the sample was split in half between support for an English-only and a dual-medium model. Moving away from a clear-cut choice between one and the other and adding complexity to the picture highlighted possible areas of support for the use of isiXhosa as an additional LoLT. More than three-quarters of the students in the two studies recognised that their mother tongue has a crucial role to play in tutorials, additional teaching material etc. This was considered most appropriate for the first year and for subjects in the Faculties of Education and Humanities (roughly one-third of the sample) rather than Science (approximately 15%). This reflects the association of African languages with low-status disciplines and domains, and does not represent a direct challenge to the hegemony of English in education.

Dyers notes that code-switching was common in tutorials, and argues that negative overt attitudes towards the use of isiXhosa by some of the students contradicted the positive covert attitudes shown in actual practice. She also argues that use of isiXhosa might be a sign of the frustration many students experienced with academic English. In both Dalvit's (2004) and Aziakpono's studies, respondents believed that using isiXhosa would improve their understanding of things they studied (mentioned by more than one-third), and, to a lesser extent, increase their confidence. Less than one-fifth believed it would improve their marks. These figures, consistent

across different institutional contexts, reflect the discrepancy between learning informally scaffolded through isiXhosa, and assessment, which only takes place in English. This, coupled with the fact that only a small minority (approximately 15%) felt that using isiXhosa would not help them at all, could be seen as an indicator of potential for change and for the emergence of a counter-discourse.

In summary, allowing for complex responses to language attitudes surveys highlights support for African languages, especially among EL2 Black students. This, however, still reflects the association between such languages and low-status domains, such as first-year tutorials and particular disciplines. In the next section I discuss two interventions involving the use of African languages at tertiary level, which partly reflect this ideological orientation.

3.3 Multilingual interventions

In this section I discuss experiences and speculation on the use of African languages in the academic context. I start with Luckett's study at the beginning of the nineties, followed by the dual-medium Bachelor's degree at the University of the North. These studies are different in scope and time, and could be seen as representing two ends of a continuum ranging from an *ad hoc* exploratory intervention to the implementation of a fully bilingual degree programme. To a different extent, however, they reflect the dominant pro-English ideology and the association of African languages with low-status domains.

3.3.1 Luckett's study and related speculations

In the early nineties, Luckett (1990) conducted research on students of history at UWC in Cape Town. Two groups of isiXhosa speakers were given teaching material in English and an isiXhosa translation, respectively. Subsequent assessment in English seemed to indicate that substituting English teaching material with similar material in the mother tongue at higher levels of education did *not* advantage speakers of an African language in terms of marks. In this subsection, I argue that this reflects the ideological orientation at the time and the constraints it posed on the study.

With respect to this experience, some considerations must be taken into account. First of all, as openly recognised by the author, the sample taken into account was small, and did not allow for generalisation. Secondly, the translation was made by language professionals in standard isiXhosa. As noted by Heugh (2000) and Barkhuizen (2001), and confirmed by research on language attitudes presented in the previous section, this variety can be problematic for the students. Comparing high-quality, well-tested material in simple English with its *ad hoc* translation into "stilted" isiXhosa could itself be seen as a reflection of the hegemonic relationship between the two languages, and of dependency of the latter on the former.

As discussed in Chapter 2, hegemonic relationships are dynamic and can change over time. Therefore it is important to note that this research was carried out during Apartheid, at a time when the status of African languages was lower than it is now. One could imagine this as having two sets of implications: 1) it might account for some of the limitations of the study. For instance, the decision that testing should be in English could be motivated by the fact that, at that time, it was difficult to envisage the use of African languages for assessment at tertiary level. 2) Low status of the African languages might account for the choice of subject, i.e. History. One could argue this is not as economically empowering a field of study as, for instance, Computer Science. Being obviously associated with tradition and the past, it would naturally seem to comply with the role associated with African languages within the Apartheid ideology.

Low status might also have affected students' attitudes towards the use of their mother tongue, which in turn might have affected their performance. Partly related to this, one could debate whether the purpose of such interventions should be improvement of performance (as can be assessed by testing in English), or rather improvement of status and change of attitudes. This is crucial to my research. As it represents a radical shift from working within the constraints of the dominant pro-English ideology to proactively challenging it. Attitudinal change can undermine the acceptance on which linguistic hegemony rests.

One of the key lessons learnt from this experience is that the focus of intervention should not be the substitution of existing material in English with the equivalent in the students' mother tongue, but on the creation of *additional* material in an African language. As noted in the previous section,

opting to use only one language in itself subscribes to a Western monolingual orientation, which favours the stronger language (i.e. English).

In a later article, Luckett (1995) encouraged the development of teaching material in the African languages, and suggested that the discussion of the subjects studied with peers and lecturers at university should take place in a common African language whenever possible. Sweetnam-Evans (2001) further speculates on Luckett's suggestions. According to this author, discussing the lectures in an African language during tutorials would help students with an African language as their mother tongue.

Sweetnam-Evans (2001) calls for the establishment of translation/research units within each university, primarily engaged in the technicalisation of the African languages (while English borrowings could be used in the meantime). These could also assist the marking of exams, which students should be allowed to write in their mother tongue. This is an important suggestion in the light of the discrepancy between the role of African languages in learning and assessment which emerged from the discussion on language attitudes in the previous section. Suggestions for the use of African languages in a high-status domain reflect a more positive orientation in more recent years. This is consistent with the increased support for African languages in Dalvit's (2004) and Aziakpono's (2008) studies mentioned above, and with the possibility of conducting wider-scale interventions such as the one described in the next subsection.

3.3.2 The dual-medium Bachelor's degree at the University of the North

In this subsection I discuss an experience which challenges the dominant role of English in tertiary education in various ways. The Bachelor's degree in Contemporary English Language Studies (CELS) and Multilingual Studies (MUST) offered at the former University of the North (now University of Limpopo) was the first dual-medium higher qualification to be approved by the Council on Higher Education (CHE) and the South African Qualifications Agency (SAQA). The two learning programmes (CELS and MUST) are taught and assessed entirely in English and Sesotho sa Leboa respectively (Ramani and Joseph 2002).

Official recognition by Government structures of a degree in which an African language is used for assessment as well as teaching of a content subject in a university degree can be seen as an example of counter-discourse, challenging the dominant role of English in the academy. The use of both languages side by side challenges the assumption that instruction in one's mother tongue would substitute instruction in English. As shown in the language attitudes research discussed above, challenging the dominant role of English in tertiary education entails adding complexity and refusing a clear-cut choice between languages.

This initiative highlights ways to tackle some of the key issues associated with the use of African languages in tertiary education, discussed above. In terms of the criticism that African languages lack technical terminology, students seemed to be comfortable using English technical terms. This is consistent with the finding that code-switching is common practice at tertiary level (see Dyers 1998 and Dalvit 2004). All the languages of the highly multilingual Limpopo Province (Tshivenda, Xitsonga, etc.) can be used in tutorial discussion and in assignments. Although the long-term plan is to offer the MUST component in other languages as well, this serves to counter the criticism that only Sesotho sa Leboa is used at the moment. As discussed in the previous section, concerns about possible interlinguistic tensions are one of the main arguments against the use of African languages in tertiary education.

Existing material in Sesotho sa Leboa (i.e. newspaper articles, films and essays on multilingualism) are used as part of a responsive and flexible curriculum. Students are engaged in a number of activities, including the translation of existing English material and the creation of original material in Sesotho sa Leboa (Ramani and Joseph 2006). Getting students involved in the active promotion of their language can be seen as a valuable contribution to their growth as organic intellectuals, challenging the present role of English in tertiary education. Recent research conducted on the programme (Ramani et al 2007) highlights that the intervention went beyond terminology development. Students developed concepts using their mother tongue and this enabled them to master academic skills such as predicting, hypothesising, challenging and justifying their position.

While the CELS programme is taught in English, Sesotho sa Leboa is the main language of teaching and assessment in the MUST programme, aimed at preparing language professionals and translators. In a multilingual country such as South Africa, expertise in this area is valuable and offers good prospects of employment. At the same time, the area of intervention (i.e. language-related studies) does not challenge the role attributed to African languages within the dominant pro-English ideology. Intervention in a more "Westernised" and English-dominated discipline (such as Computer Science, for instance) might have a stronger and more radical ideological impact, and provide a strong argument for the use of African languages in all domains. This is further discussed in the next chapter.

3.4 Summary and conclusions

Language plays a crucial role in determining academic success. In South Africa, a student's mother tongue and proficiency in English are almost inextricably linked to his or her socio-economic and educational background. English proficiency, as measured by Matric results for the subject, is a better predictor of academic success than mathematics, even in "technical" subjects such as Computer Science. This highlights the overarching hegemonic role of English, as its mastery either as a first or second language determines access to and chances of success in economically empowering fields of study.

In spite of its role in perpetuating their subordinate position, Black students have generally positive attitudes towards English and high levels of self-assessed proficiency. Figures are higher for those who attended EL1 schools, who feel they have more to gain from its dominant role. However, signs of a more critical point of view are evident, and, as one adds complexity, possibilities for the use of the students' mother tongue as an additional LoLT emerge. These mainly reflect the dominant ideology, which associates African languages with low-status domains such as first-year courses and subjects within Education and the Humanities.

While the potential of African languages in improving understanding and confidence is generally recognised, Black students did not believe this would improve their marks. This reflects the discrepancy between the informal use of the students' mother tongue in scaffolding learning and the

official use of English as the only language of assessment. Concerns about the possible negative consequences of using an African language in education seem to be based on preconceived attitudes and general orientation rather than practical concerns. Fear that this would entail inter-linguistic tensions was equally strong at institutions with very different linguistic compositions. On the other hand, overall support for African languages was stronger for recent studies, as opposed to studies conducted immediately after the end of Apartheid. This could be seen as an indicator of potential for a shift in the ideological balance.

In the nineties, practical interventions and speculations on the possible use of African languages as LoLT at tertiary level reflected the limitations imposed by the legacy of Apartheid. The low status of African languages prevented meaningful comparison with English The findings of such experiences, still conforming to the dominant pro-English ideology, would seem to discourage the use of African languages. Recently, more audacious interventions (such as the dual-medium Bachelor's degree at the University of the North) show the possibility of challenging the dominant position of English as the sole LoLT at tertiary level. The topics chosen for such interventions, however, still reinforce the association between the use of African languages and a restricted set of (often low-status) subjects of study. In the next chapter I challenge this.

CHAPTER 4: AFRICAN LANGUAGES AND ICT EDUCATION

In this chapter I explore the relationship between African languages and Information and Communication technology (ICT) in the context of the process of intellectualisation of such languages. I explain the focus on CS students in my research and its potential to challenge the dominant pro-English ideology. I then discuss the relationship between the local context and languages in the teaching of Computer Science. I then argue for the importance of unpacking technical terms in a scientific subject such as Computer Science in order to scaffold learning.

4.1 African languages in high-status domains

In this section I discuss the use of African languages in high-status domains. I start with a discussion of the importance of intellectualisation and of the rationale for using African languages in high-status domains. I then focus on ICT education, its importance for South Africa, and the need to increase access to it for members of previously marginalised communities.

4.1.1 Intellectualisation

Alexander (1989) highlights the transformative potential of language planning and calls for the *intellectualisation* of South Africa's indigenous languages. Intellectualisation is a way of providing "more accurate and detailed means of expression, especially in the domains of modern life, that is to say in the spheres of science and technology, of government and politics, of higher education, of contemporary culture, etc." (Garvin 1973:43). According to Finlayson and Madiba (2002:42), African languages lag behind English and Afrikaans particularly when it comes to modern terminology and registers. This makes the possibility of using them within scientific academic discourse a contentious issue.

Alexander (1995; 2001) emphasises the role of the university as an agent of social change. Bourdieau (1994, cited in Alexander 2001:12) notes that "language policy and language practices in institutions such as universities inevitably either reinforce or counter societal tendencies towards the unequal distribution of resources, opportunities and life chances". South African universities have an important role to play with respect to the intellectualisation of African languages, both by assisting in developing them and by using them as LoLT, particularly in high-status subjects. Finlayson and Madiba (2000:48) explicitly refer to the advantages of using both English and an African language in science education at tertiary level (see Inglis 1993:131 and Rutherford 1993:286, cited in Finlayson and Madiba 2000).

Using African languages to teach highly empowering but traditionally English-dominated subjects (such as Computer Science, for instance) at tertiary level could have two sets of effects. First of all, it would improve their status. This, in turn, would improve the attitudes of their speakers and their sense of pride in using them in all domains. Raising the status of African languages would raise the status of their speakers. Secondly, the use of African languages would facilitate the participation of their speakers in such domains, thus effectively addressing the inequalities of the past. This would have a deep transformative impact on the specific academic discourse of scientific and technological disciplines as well as on society as a whole. The intellectualisation of African languages through their use in higher education could contribute (and potentially drive) the kind of social transformation envisaged by Gramsci.

4.1.2 African languages and ICT education in South Africa

The South African Government recognises the paramount importance of technology as well as Mathematics and Science education for the development of the country and to address past inequalities. The Departments of Education and of Communication (DoE and DoC 2001) recognise that the education system has a crucial role to play in bringing the advantages offered by new technologies to members of previously disadvantaged communities. Various projects have been instituted (e.g. Muwanga-Zake 2007; Beute 2006; Dalvit et al. 2007a; see also Dalvit et al. 2006a).

While most projects focus on the deployment of ICT infrastructure, i.e. PCs and Internet connection, comparatively little attention is given to the development of human resources. The e-Education White Paper highlights the importance of supporting ICT integration in teaching and learning and building educators', managers' and students' confidence in the use of ICT. Infrastructure is often just "dumped" in schools without a clear integration strategy (see Brandt 2006). As noted by Czerniewicz (2004), it is not enough to provide physical access to computers and information. In order for ICT to be effective in education, the conditions must be created for students to effectively appropriate the use of the new technologies, understand how they work and how to use them.

Chisholm (2004) argues that, together with lack of access to ICT, the language barrier posed by the use of English is a factor in the entrenchment of inequality in South African education. The Department of Education (DoE 2005) acknowledges the potential role of English as a "gatekeeper" to the study of ICT and to its use in education, and emphasises the need to promote technological discourse in African languages. Most students in marginalised schools are speakers of an African language who are excluded both from the study of empowering subjects (such as Computer Science, for instance) and from gaining proficiency in the dominant language in these fields (i.e. English). Until the use of ICT in education rises from the currently low levels (Tlabela 2007), the university remains the main arena in the struggle for equal access to ICT.

Greyling and Calitz (2002) note that Computer Science departments at South African universities are under pressure from the computer industry to produce Black graduates and postgraduates. A decade after the end of Apartheid, Black students are still under-represented in ICT-related fields of study such as Information Systems and Computer Science. According to Greyling and Calitz, language problems are partly to blame. However, the approach they propose, i.e. devising strategies to better select and streamline potential CS students, is reactive rather than proactive. In other words, their focus is on optimising the use of resources of the university given the context (i.e. underpreparedness of many Black students, dominance of English in the ICT field, etc.).

This approach is common to many foundation programmes, which are informed by a technological-determinist approach. Within this approach, technology is seen as developing independently of the social context in which it is used. Students are therefore just required to learn to master technology as it is. Within the approach of Social Informatics, on the other hand, ICT are seen to be shaped and can in turn shape their social context. This highlights the flexibility and transformative potential which are an essential characteristic of the new technologies. In the next section, I discuss the Africanisation of ICT education in the light of Social Informatics and Ethnocomputing theories.

4.2 Theoretical framework shaping my intervention

In this section I discuss the middle and low-range theoretical frameworks which shaped the practical component of my research, described in Chapter 8. Consistent with the tenets of Social Informatics and Ethnocomputing, I advocate the integration of cultural and linguistic components into software development and ICT education. My focus on the lexico-grammatical level to unpack English technical terms using the students' mother tongue was informed by discussion of the specific nature of teaching science subjects within Functional Linguistics.

4.2.1 Ethnocomputing and the role of students' knowledge

In this subsection I discuss the principles underlying Social Informatics and Ethnocomputing, as opposed to those underlying Technological Determinism. Technological Determinism views technology as developing independently of society. Within this model, ICT is developed by "experts", mainly located in a few developed countries, for the consumption of masses of users. In developing countries, this entrenches the role of CS students as "recipients" of knowledge produced somewhere else, thus reinforcing dependency. When trying to tackle problems of access to the study of Computer Science, this is reflected in approaches such as the ones described above (Greyling and Calitz 2002; Rauchas et al. 2006). Emphasis is put on selecting students with greater chances of success within the existing model. This entrenches rather than challenges existing hegemonic structures.

Social Informatics emphasises the correlation between technological and social change. Kling (2000) notes that the influence works in both directions. The relationship between technology and social change (which includes the redistribution of power) is central to both the field of Social Informatics and Ethnocomputing. While Social Informatics deals with the impact of technology within a certain society, Ethnocomputing is mainly concerned with the way technology (and particularly the use of computers) shapes and is shaped by different cultures.

The paradigm proposed by Ethnocomputing can be applied to exploring the relationship between developed and developing countries. Since computers have been invented in the West, they tend to reflect Western values and cultural traits. Therefore, technological dependency of developing countries on developed ones could be seen as a reflection of cultural dependency. In order to counter dependency, developing countries cannot simply be consumers, but must become producers of knowledge about technology.

The teaching of programming skills and Computer Science has a crucial role to play in making ICT more relevant and accessible in developing countries. With specific reference to an African context, Tedre, Sutinen, Kahkõnen and Kommers (2003) argue that students' knowledge should be integrated into the teaching of Computer Science. These authors believe that

> Fostering culturally bound ways of inferring, quantifying, classifying, representing, and measuring, will definitely lead to a better understanding of science because it supports the students' mental images. Also, this esoteric knowledge may well produce new ideas and fresh views on Computer Science itself. (Tedre et al. 2003:174).

The passage above highlights two of the *tenets* of Ethnocomputing, i.e. the belief that students' existing knowledge can scaffold the learning of Computer Science, and that this in turn can contribute to reshaping the discipline to respond to local needs. In terms of reproduction of hegemonic relationships through education, the former point is particularly important.

In learning Computer Science, the prior knowledge possessed by Western students is used in understanding new concepts. The metaphor of a desktop environment, for example, draws

extensively on the familiarity of most Western students with office environments and with objects such as folders, files, recycle bins, etc. Many Black students from rural and township schools, however, are not familiar with such artefacts, and the metaphor does not support their learning in the same way (Thinyane et al. 2008).

As is the case with Western students, reliance on examples from their daily lives would enable Black students of Computer Science to integrate new technological knowledge into their existing knowledge structures. The challenge is to strike a balance between relying on students' background to scaffold access to the study of Computer Science and "reshaping" of the discipline to fit into the students' cultural reference system. The teaching and learning of Computer Science should reflect the multicultural and multilingual reality of many Black students.

Students' existing knowledge has a crucial role to play in providing metaphors that the teaching of Computer Science could draw on. For example, the use of fractals in indigenous knowledge could be used to teach recursion (Tedre et al. 2003:177). African languages can promote access to ICT, linking it with students' everyday experience. A number of ICT resources are available in African languages. Their use and possible contribution to teaching and learning Computer Science is discussed in the next subsection.

4.2.2 ICT resources in African languages

A number of resources in African languages are already available in the high-status domain of ICT. However, their use does not seem to be widespread among speakers of such languages, and they are seldom used in education. The process of adapting ICT resources to contexts different from that in which they were originally developed is called *localisation*. Localisation in African languages, though in its initial stages, covers a number of different technologies.

Bosch and Roux (2002) note that Human Language Technology (HLT) in South African indigenous languages is still at the initial stage, but enjoys support from the Government. Attempts to develop text-to-speech and voice recognition technology in various African languages have been

made as part of academic research projects (Oosthuizen et al. 2006). In recent years, Microsoft has worked in collaboration with various government bodies, such as PanSALB (SA Goodnews, 20 April 2006) to make some of its products available in African languages. Windows XP has been localised in Afrikaans, Zulu and Tswana, and Vista includes various other South African official languages (Microsoft 2008).

Microsoft dominates the end-user market, and these products could potentially reach millions of Africans. Microsoft's "top-down" approach, however, seems to prioritise quality over user involvement, and might not be suited for the South African context (Dalvit et al. 2008b). Open-source software caters for a comparatively small section of the end-user population. Its collaborative and user-centric approach to software development, endorsed by the South African government (see Weber 2004), seems to be more suitable for catering for less powerful languages. Translate.org.za is an NGO committed to the localisation of open-source software in all eleven official South African languages. Since 2001 it has been active in making popular open-source software available in a number of African languages. In August 2008 alone, approximately 4GB of localised software was downloaded from their official file server.[6] This suggests a definite interest in ICT resources in African languages, though little evidence is available on their actual use.

Maşoeu and de Villiers (2001) note that, at the present stage, localisation of software into African languages serves more a symbolic than an instrumental function. In other words, its main contribution is the promotion of the status of the African languages rather than increasing access to technology for their speakers. Although this could still be considered crucial to break the dominance of English in the field of ICT, one must consider that the users in Maşoeu and de Villiers's (2001) study, like most Black university students, were already familiar with computers in English. Research at Master's level, in which I am involved as a supervisor, is currently exploring the experience of students' learning computer literacy partly in isiXhosa from the beginning. Initial results seem to be encouraging, both in terms of students' attitudes and access to the discipline.

[6] This is an estimate based on preliminary analysis of the system log files. A more detailed analysis forms part of a future publication.

While the use of African languages can make a significant contribution to improving access to technology and ICT education for members of marginalised communities, ICT can contribute to the development of African languages and their use in education. Dalvit et al. (2005a) discuss the possible contribution of ICT to solving some of the problems traditionally associated with the use of African languages in education, outlined above. In terms of the supposed underdevelopment of African languages, ICT could have a standardising effect in promoting the use of a common standard, in much the same way that TV did for other languages. The necessary government structures are already in place to promote coordination among various efforts. Once this is achieved, supporting the widespread use of a common standard would help to overcome regional differences among different varieties.

In these early stages, the primary focus of localisation into South African indigenous languages can be considered its contribution to terminology development. There is little coordination among various agencies and, as a result, the same term can have multiple translations. For example, "View" can be translated into isiXhosa as either "*jonga*" or "*bonisa*". The translate@thon[7] methodology that was perfected by Translate.org.za can be seen as an example of the "bottom-up" approach to terminology development. Working collaboratively on-line, volunteer translators engage directly with the development and choice of new terms. This type of event serves another important function of localisation in these early stages, i.e. raising awareness around language issues and the need to promote African languages in high-status domains (Dalvit et al. 2008c). This is important in supporting a counter-discourse to the dominance of English in the ICT field.

An argument against the use of African languages, particularly in the field of ICT, is the fear that, if students learn about computers in their own languages, they will not be able to function in English and apply their knowledge in the workplace. Although it is undoubtedly true that English is the main language of science and technology, many other languages are used in the field of ICT and their speakers are competent programmers and computer scientists. Once again, the almost exclusive use of English in the field of ICT in South Africa seems to be based on hegemonic relationships between languages and their speakers rather than on linguistic considerations. High-quality material in African languages can scaffold learning of Computer Science by their speakers.

[7] A "translation marathon", during which a group of volunteers works collaboratively online to localise a piece of software. The method was perfected by Translate.org.za.

In the next section I discuss the most appropriate level of intervention, consistent with the specific features of the CS discourse.

4.2.3 Academic discourse in the humanities and the sciences

As discussed in Chapter 2, most remedial strategies to provide increased access to tertiary education for members of marginalised communities are informed by the discourse-based approach. This was historically developed in the humanities as part of the New Literacy Studies. However, functional linguists such as Halliday and Martin (1993) explore issues of power within the discourse of science as well as the humanities. Their view of language and academic discourse as tools lends itself to practical applications. In particular, the comparison between discourses in different disciplines highlights the importance of developing a specific approach for the sciences, focusing on the lexico-grammatical level.

Halliday and Martin (1993) explore the differences between academic discourse in the sciences and humanities. He starts by pointing out that "discourses are tools – they do things. This is why they have evolved and thus their functionality determines their character" (Halliday and Martin 1993:221). According to Halliday and Martin, the main purpose of academic discourse in both disciplines is to classify, defining things (i.e. concepts, processes, ideas, objects) and relationships between them.

Halliday and Martin (1993:210) provide a description of some typical features of "scientific language", and notes that "in order to understand technical discourse both the definitions and the relationships among what is defined are critical". Definitions link technical terms with existing knowledge. Relational clauses ("a kind of" or "a part of"), while referring to existing semantic relationships in the mind of the reader, clarify the relationships between technical terms. Explanations, on the other hand, describe processes and make use of material (action) clauses such as "if... then...". Nominalisation, i.e. the rendering of processes as nouns (e.g. installation), plays a crucial role with respect to this. It allows technical discourse to treat processes as things, thus allowing for classification as well as critical discussion.

Academic discourse in the humanities is characterised by abstraction. This involves the nominalisation of processes, e.g. “the *attempt* by the soldiers to capture the city” as opposed to “the soldiers *tried to* capture the city”. This allows the reader to work with abstract concepts, e.g.. an attempt, as objects which can be put in relation to others, in a cause-effect relationship. Abstraction foregrounds relational clauses at the expense of material ones. The discourse in the humanities classifies rather than defines.

In the humanities, common words are used to refer to specialised concepts, and the relationship between words and concepts is not as clearly defined and univocal as in the sciences. For example, “soldiers”, “troops”, “armed forces”, “army” could all be used interchangeably in the sentence “on 1st September 1939, the German *soldiers* invaded Poland”. The purpose of academic discourse in the humanities is to generalise, drawing on students' existing linguistic resources to interpret reality. In classroom practice, the teacher usually translates “academic English” into “simple English”, rephrasing difficult sentences using common words.

While abstraction is a more crucial feature in the humanities, technicality is central to the discourse of science. Technicality refers to the use of technical terminology to refer to new, subject-specific concepts. Halliday and Martin (1993) emphasise that technical terminology cannot be dismissed as jargon. Technical terms do not stand in a one-to-one relationship with common words. Academic discourse in the sciences reconstructs rather than interprets reality, by creating new concepts and organising them in different taxonomies from the ones students are used to.

For example, while in common sense diseases are commonly classified according to their symptoms, in scientific knowledge they are reclassified according to their cause. This means that scientific knowledge allows for a distinction between two diseases which present the same symptoms, but are caused by two different viruses, while common sense does not. Access to scientific discourse, therefore, provides students with a different, and possibly more accurate, view of reality. Technical terms play a crucial role in building the new taxonomies which make this possible. In classroom practice, technical terms are often unpacked by the teacher in a language students understand. Halliday and Martin also note that quality of exposition, which is crucial in the

humanities, is not the main focus of scientific discourse (including that of Computer Science), in which students are expected to produce mainly short definitions.

Hyland and Tse (2004) provide a corpus-based analysis of academic discourses across various disciplines. They note greater variation between disciplines within the sciences and the humanities than between the two categories themselves. In particular, they highlight some specific features of the Computer Science discourse compared to other science subjects. On the one hand, Computer Science deals with impersonal computational calculations. On the other hand, it is an applied discipline with a practical orientation. In this sense, Computer Science can be considered similar to Mathematics. This parallel is confirmed by the fact that, historically, Computer Science as a discipline started as a branch of mathematics.

Research into the teaching and learning of mathematics at primary and secondary level in South Africa (Setati and Adler 2000) provides some insights into the use of African languages in classrooms. Although the context and subject are clearly different from that in my study, some of the findings are relevant for the teaching and learning of Computer Science at university. Students make extensive use of their mother tongue in one-to-one interactions and in exploratory talk, while using English mathematical terms. In particular, the authors note a language shift when moving from calculational to conceptual discourse. Through exploratory talk in their mother tongue, students make sense of the new technical terms. This can only happen in a language the student knows well, as he or she needs to draw on his or her full linguistic repertoire in this cognitively demanding situation.

As is the case at lower levels, at university Black students already use their mother tongue in action clauses for a number of subjects, including Computer Science (see Dyers 1998; Dalvit 2004). Like speakers of many other languages, speakers of African languages often resort to the use of English borrowings within explanations in their mother tongue. However, unlike for English speakers, this process is not scaffolded by good-quality teaching material developed by professionals. This reinforces the perceived linguistic inequality between English and the African languages.

Intervention at the lexico-grammatical level, for example providing students with translations and explanations of technical terms in their mother tongue, would constitute a more structured and consistent approach towards using African languages to support learning. While it would be unrealistic to expect this to improve marks in assessment carried out in English, being able to rely on additional material in their mother tongue could improve students' understanding of the concepts taught. Most importantly, this type of intervention could improve the attitudes of speakers of an African language towards the use of their mother tongue in the academic context.

4.3 Summary and conclusions

Universities have an important role to play in promoting the development and use of African languages in high-status domains. These include the academic domain and, particularly, economically empowering but traditionally English-dominated subjects in the fields of science and technology. Intellectualisation can promote the status of African languages and increase access for their speakers to disciplines such as Computer Science.

Participation in the ICT field for members of marginalised communities is recognised as a priority by the government. South African universities are under pressure to grow the number of Black students in ICT-related disciplines. Because of its dominant role in this domain, English can act as a "gatekeeper". Current approaches, consistent with the dominant pro-English ideology, are assimilative in nature, and do not posses real transformative potential on a large scale. New approaches are needed to address language issues, possibly reshaping the discipline of Computer Science itself and the way it is taught.

Social informatics and Ethnocomputing focus on the dynamic relationship between technological and social change. The tenets of Ethnocomputing are the integration of cultural aspects into software development and into the teaching of ICT-related subjects. Unlike Western students, the prior knowledge of many African students does not scaffold their learning of Computer Science. Integrating both Western and African cultural and linguistic aspects into the ICT resources they use and the teaching of ICT-related subjects would be a better reflection of their multicultural and multilingual reality.

Various ICT resources have been localised for the African context, some in African languages, but are seldom used for educational purposes. Because of its ideological orientation, free/libre open source software (FLOSS) seems more suitable than proprietary software to cater for marginalised communities and languages, and offers more transformative potential. The use of ICT can contribute to solving some of the problems traditionally associated with the use of African languages in the classroom, such as printing costs, for instance. Software interfaces localised in the student's mother tongue can facilitate access to technology, which can then be used in any language.

Challenging the traditional association of African languages with subjects in the humanities, a bilingual approach (combining the use of English and the students' mother tongue) would seem more suitable for the teaching of scientific subjects. Scientific academic discourse is characterised by technicalisation. Teaching in the sciences focuses at the lexico-grammatical level ("unpacking" technical terms) rather than the discoursive level, characterised by abstraction and central to teaching in the humanities. The use of African languages in teaching Computer Science would scaffold the unpacking of the new and ever-changing terminology, reflect the common practice of code-switching in the classroom.

CHAPTER 5: METHODOLOGY

In this chapter I describe the methodological aspects of my research. I start with the research paradigms I subscribe to. I then discuss my approach and how it relates to the methods I have used. I then provide an overview of the process and sample for the various methods. I conclude with some considerations about my role as a researcher, the problems I encountered and possible improvements. The purpose of this chapter is to describe and motivate the methodological choices which informed my research. Given the variety of methodologies I used, more detailed additional information relevant to different components is provided in the relevant chapters.

5.1 Methodological framework

In this section I describe my methodological framework. I discuss my research paradigm, looking at my assumptions, goals and tentative hypothesis. I then discuss my research approach and its links to my research paradigm. The concept of praxis, central to neo-Marxist philosophy, acts as a guiding thread.

5.1.1 Research paradigm

My study was inspired by Gramsci's belief that research needs to have a practical impact on society. My main goals are to gain a better understanding of hegemonic relationships in tertiary education, and to challenge the dominant role of English. The first goal was achieved by analysing the academic performance and language attitudes of two different groups of students studying ICT at Rhodes University, and by reflecting on the comparison between the findings of the two analyses. The second goal was achieved through a practical intervention in the ICT domain. The terms of such intervention were shaped by theories of Ethnocomputing and of Functional Linguistics.

Gramsci's thought can be defined as a philosophy of praxis (Adamson 1987). Its main goal is practical intervention in order to bring about the type of social change by countering hegemony.

Within this theoretical paradigm, the primary role of philosophy and academic debate in general is to have a practical impact on society by criticising the *status quo* and challenging the dominant ideology. In Gramsci's view, part of the role of education is the formation of organic intellectuals. This entails changing educational praxis.

Alexander (1995:40) highlights the danger that, in South Africa, "the simplistic adoption or implementation of [European and American] theories, under present conditions, tends to revive and to reinforce Apartheid structures and patterns". While the reference to Gramsci would suggest a link to neo-Marxism and to critical pedagogy, I tried to adapt these ideas to the contemporary South African context. Particularly in terms of language policy and practice, tertiary education has not moved away from the *praxis* of Bantu Education. With my research, I sought to critique and challenge such praxis.

The first component of my critique, discussed in Chapter 6, was an analysis of the performance of Black students from different educational backgrounds compared to White English-speaking students. Black EL1 students, having enjoyed the same quality of education as English-speaking White students, could be expected to have a comparable level of English proficiency and perform equally well at tertiary level. Based on this assumption, providing a growing number of Black students with access to the same quality of education enjoyed by White students might seem a viable route to social and educational equality. My tentative hypothesis was that, regardless of their educational background, Black speakers of an African language would still under-perform compared to White English speakers.

The second component of my critique, discussed in Chapter 7, was a study of language attitudes. One of the critiques of the use of African languages in the academic domain is lack of support by their speakers. This is particularly important in a democratic society like South Africa, as it implies that the current pro-English policy reflects the will of all stakeholders (see de Klerk 1996). My tentative hypothesis was that allowing for complexity in the responses would highlight the possible role African languages could play as additional LoLT, even in an English-dominated field such as Computer Science

As noted in Chapter 2, within neo-Marxist theory the concept of ideology rests on the possible discrepancy between existing power structures and their representation. Ideologically-loaded representations are then used to entrench hegemony through the acceptance of those who are disadvantaged by it. In my critique, I reflected on the relationship between the performance and the attitudes of various groups of students, using language as the main variable for comparison. Exploring possible tensions between performance and attitudes in order to gain a better understanding of the hegemonic relationship between English and African languages in tertiary education was one of the goals of my research.

In order to challenge the linguistic hegemony of English, I conducted a practical intervention, discussed in Chapter 8. My intervention involved the use of additional teaching material in an African language. This took the form of a glossary of English technical terms translated, explained and exemplified in isiXhosa. This is consistent with the tenets of the discipline of Ethnocomputing, discussed in Chapter 4. The integration of cultural aspects such as language in the teaching of Computer Science can contribute to increased access and to reshaping the discipline itself. African students can therefore be empowered to develop solutions suitable to the local context, thus actively challenging cultural and technological dependency. The focus on an economically empowering but English-dominated field such as ICT can have an ideological impact and make a strong case for the use of African languages in any discipline.

For my practical intervention, I focused primarily on the development of a glossary of English technical terms translated, explained and exemplified in an African language (isiXhosa). The focus on the lexico-grammatical level is consistent with the discussion in Chapter 4 on the specificity of scientific academic discourse, particularly in Computer Science. It also represents an effort to "institutionalise" the current practice of code-switching between English and African languages, which takes place at all levels and in all domains While this was the primary media to expose students to the use of an African language in the academic context, I used a variety of localised ICT resources.

It is important to remember that the goal of my practical intervention was not to improve the marks of speakers of an African language in Computer Science. Within a Gramscian view,

performance (and possibly under-performance) is the product of hegemonic relationships, enacted through the education system. My intervention sought to challenge such relationships by exposing Black students to material in an African language in order to change their language attitudes. The relationship between action and attitudes is discussed in the next subsection.

5.1.2 Research approach

In this subsection I discuss my research approach, linking it to the research paradigm discussed above. I use statistical analysis and attitude surveys to critique the *status quo* and gain a better understanding of hegemonic relationships in tertiary education. The data I collected was used to inform the action research component of my study, in which I focused on a practical intervention targeting a particular group of students. Statistical analysis and the survey approach have long been used in educational research. Action research is comparatively new and deserves more attention.

Avison et al. (1999:94) emphasise the interrelation between research and action by pointing out that "action research encourages researchers to experiment through intervention and to reflect on the effects of their intervention and the implication of their theories". These authors also highlight the focus on "change and reflection within an immediate problematic situation", which characterises this approach. Its focus on research as a tool for change makes action research a suitable approach within a philosophy of praxis.

Another feature of action research is its iterative nature, which makes it suitable for interventions both in the fields of Information Systems and Education. Research typically follows a cycle of problem diagnosis, action intervention and reflective learning, which can be reiterated several times if needed. My research has a reflexive and self-reflective character: students were encouraged to reflect on their experience and I, as a researcher, continuously questioned my own assumptions in the research process. Information collected in the survey was combined with lessons learnt from the practical component of my intervention, to inform subsequent developments.

Action research is particularly suitable to complex situations, and has been used in a variety of studies involving grounded theory, ethnography and case study methodologies. With reference to the latter, Avison et al. (1999:96) talk about action research-type case studies, in which "researchers have large and complicated stories to tell". According to these authors, the main difference between the case study and the action research approach is that the former focuses on what people say they do, while the latter focuses on what people actually do.

The relationship between action and expressed attitudes, problematised in Chapter 2, is crucial to language attitudes research, and is therefore important for this study. A shift in language attitudes can be an indicator of change in hegemonic structures. In my research, I observed how the use of material in an African language impacts on the attitudes of a particular group of Black students. More positive attitudes towards the use of African languages are not necessarily an indicator of change in behaviour. However, they indicate overt support for a more pro-African languages ideology, and within the current democratic dispensation this is a necessary condition for a change of educational praxis. Black students also play a particular role as potential organic intellectuals. Consistent with the idea of a philosophy of praxis, which informs my research, fostering a more critical point of view on language issues among students was central to my research.

5.2 Methods used

In this section I provide a brief outline of the research methods I used, namely statistics, questionnaires, interviews and observation. My research focused on speakers of an African language who took computer courses at Rhodes. Other students (mainly White speakers of English) were considered for comparison purposes. Different methods were used for different (but largely overlapping) samples. I also discuss the development of content and delivery system for web-based teaching material. Both content and system constituted an integral part of my intervention. Such intervention targeted students in the Science foundation computer course. The purpose of this section is to introduce the methods used. to describe them conceptually and to highlight possible issues. A more detailed description of the sample for each method, of how the data was elicited and analysed is provided in the following section and in Chapters 6. 7 and 8.

5.2.1 Statistics

Many of the studies on science foundation programmes referred to in Chapter 3 used statistical analysis. In my study, I used descriptive statistics for the analysis of the impact of language and other factors on the performance of Rhodes CS students in the period 2001 - 2006. I focused mainly on speakers of English and speakers of an African language. These two groups were chosen to highlight the effects of linguistic hegemony on academic performance. Among speakers of an African language, various particular groups were taken into account (e.g. students who attended EL1 schools) in order to isolate the impact of home language from that of educational background. Speakers of isiXhosa and foundation students were also dedicated special attention as the primary target of my intervention.

I used a combination of graphs and tables and an analysis of statistical correlation between variables using a chi-square test. These are commonly used in statistical analysis within the humanities (Pagano 2001). I am familiar with these techniques from my Masters' research (Dalvit 2004; Dalvit and de Klerk 2005). They have been used in some of the studies referred to above (see Negash 2001; Dambisya and Modipa 2004).

My research sought to be more extensive than other studies, as it involved a large number of students and comparison of different groups within the sample. In defining such groups, I used different indicators. Home language would have been the most obvious choice, but as noted by de Klerk (1996), it is not very reliable. For historical and political reasons, race is probably a more reliable indicator: speakers of an African language might indicate English as their home language, but there can be little ambiguity about their racial affiliation. This indicator was used by Negash (2001) in her research at Rhodes University. Reflections on this study suggest that further complexity needs to be added, and that race alone is not a sufficiently reliable indicator of a student's background. As in Negash's study, I took citizenship into account, differentiating between South African and non-South African students.

Among South African students, I used first language in Matric as a reliable indicator of a Black student's educational background. Most schools in townships and rural areas offer English only as a

second language, while a considerable proportion of Rhodes Black students attended multiracial schools and wrote English as a first language. English Matric results are often considered in statistical research as predictors of academic success (see Dambisya and Modipa 2004). However, I have not come across any study which considers the important distinction between Black students who wrote English as a first and as a second language in Matric. Results for other subjects, such as Mathematics, which have often been used as predictors of success in Computer Science have also been included. Other indicators, such as gender, for instance, have been considered for purposes of comparison.

I analysed correlations between background variables (home language, race, gender, citizenship), Matric results (mark and grade for each subject, English as a first or second language) as well as Computer Science performance of students who enrolled for CS courses in the period 2001 - 2006. Academic performance could be described as a broad indicator of the way in which a student meets the formal targets of the education system. This of course is a very broad definition which leaves ample space for different interpretations of what it means to "meet the formal targets". The common understanding seems to take two dimensions into account: achievement and longevity. Achievement refers to performance measured in marks, while longevity refers to the highest level a student reaches within the system. These are the two indicators I used when applying statistical analysis in my research.

Within the critical pedagogical paradigm, the definition of academic performance is problematised. Knight and Pearl (2000:215-6) highlight the difference between intellectual competence and academic achievement, arguing that the latter is often confused with docility. In other words, achievement may reflect how well a student adjusts to the system, while intellectual competence emphasises the student's ability to create new knowledge. These authors also emphasise the impact of the context, both within and outside the classroom, on performance. Students' self-confidence and general attitudes are good predictors of both performance and competence, even when previous performance is taken into account.

In my research I took academic performance, as can be measured by achievement and longevity, as a starting point. Consistent with the critical pedagogical paradigm, academic performance was

considered not as an absolute and independent indicator, but within a dynamic relationship with students' attitudes. Badat (2008) problematises assessment and the concepts of standard and quality in a transformative context such as tertiary education in South Africa. This is consistent with the relativistic and dynamic stand I took towards measurement of performance.

5.2.2 Questionnaire

Questionnaires are commonly used in research on language attitudes (see de Klerk 1996; Dyers 1998), often in combination with follow-up interviews. The starting point for the development of the questionnaire I used was the tool I used for my Masters' research (Dalvit 2004; Dalvit and de Klerk 2005). This was a 30-item questionnaire designed to assess the general language attitudes of isiXhosa-speaking students at the University of Fort Hare, a previously disadvantaged and predominantly isiXhosa-speaking institution. It had to be adapted in three ways.

First of all, the focus needed to be language attitudes in the ICT fields. Specific issues (e.g. lack of technical terminology) had to be given the appropriate prominence. Secondly, questions needed to be relevant to the Rhodes University context. Rhodes is a traditionally English-medium university where isiXhosa speakers constitute approximately 15% of the student population. Proposing the use of isiXhosa as LoLT in class, while theoretically possible in some contexts at Fort Hare, would not make sense at Rhodes. Thirdly, the questionnaire needed to be redesigned to address speakers of various different languages. Unlike Fort Hare, the body of Black students at Rhodes is linguistically heterogeneous.

The questionnaire I used for the present research has been administered in three different years: 2004 (see Appendix A), 2005 (see Appendices B and C) and 2007 (see Appendices D, E, F and G). The 2004 questionnaire served mainly an exploratory purpose, and it targeted first-year students of computer courses who were also speakers of an African language. The 2005 questionnaires targeted students who took a computer course at Rhodes, and who were enrolled in that year. Separate questionnaires were administered to speakers of a South African indigenous language and of other languages. My intention with these questionnaires was to highlight the difference between speakers

of an African language and of English. Although this sample did not coincide with the one of my statistical analysis, it was the closest approximation I could get. The 2007 questionnaires served to evaluate my practical intervention, and targeted students in the foundation computer course for Science.

Since different questionnaires served different purposes, the number, order, type and phrasing of questions as well as the respondents I targeted changed. While this makes comparisons across questionnaires more complicated (though still possible), it reflects the evolution of the tool I used in response to the lessons learnt in each step of my research. This is consistent with the action research methodology. The process of developing the tool based on the results has probably been as informative as the results themselves. Consistent with the action research approach, the questionnaire was not used as a static tool, as is often the case in surveys, but as an instrument of self-reflection. Analysing responses and, most importantly, comments informed the development of the web-based tool I used in my intervention as well as subsequent versions of the questionnaire itself.

Some of the studies mentioned above (i.e. Barkhuizen 2001 and Dyers 1998; see Frazer and Lawley 2000:93) made use of questionnaires in two languages. The final version of the questionnaire used in this study was made available in two languages. The translations into isiXhosa (Appendices E and G) were done by members of the SANTED programme at Rhodes. Using a questionnaire in two languages in the last phase seemed consistent with promoting the use and status of African languages. This was an attempt at making the ideological stand of the research, i.e. language equality between English and isiXhosa, explicit. This was also intended to ensure the inclusion of students with low levels of English proficiency. These might be the most interesting respondents. Based on the experience of my Master's research (Dalvit 2004; see also Aziakpono 2008), the analysis of the differences between respondents who chose to fill in the English as opposed to the isiXhosa version promised to yield interesting results.

The first section of the questionnaire requested information about several background variables, such as language, gender, social and educational background, degree and year of study, level of computer literacy and familiarity with localised software in the student’s mother tongue. The

second section dealt with language attitudes towards English and African languages in general and in the field of Computer Science. The third section concerned students' beliefs about possible consequences of the use of African languages as additional LoLT and envisaged best practices. The fourth section created space for comments and for respondents to leave their details for follow-up interviews. I used a combination of different types of questions (factual or concerning subjective experiences, open-ended or closed-ended) and answer formats (classic, rating scales, Likert scale or ranking). Attention was also paid to question order, proximity and avoiding bias (see Frankfort-Nachmias and Nachmias 1996, cited in Dalvit 2004, for a discussion on the use of each question type in language attitudes research).

For the administration of the questionnaire, I used several different on-line systems, ranging from Questionmark (2007) to Moodle (2007). This entailed the risk of excluding those students who were not confident in using computers. This should have been minimised by the choice of students who had attended CSc1L or at least one year of Computer Science. In order to accommodate first-year students, the questionnaire was run towards the end of the semester, to make sure students had become familiar at least with the use of basic on-line tools. The use of web-based applications instead of paper-based questionnaires made data collection and capturing much faster. The follow-up questionnaires run at the end of 2007 served an evaluative function and were functional to the preparation of the interviews. In order to maximise participation to get a more comprehensive overview, printed forms were used instead of the on-line system.

5.2.3 Interviews and observation

Interviews are an established and widely used method in the social sciences and in educational research. In my previous study on language attitudes (Dalvit 2004; Dalvit and de Klerk 2005) I used follow-up interviews to complement the data obtained through the questionnaire. In the present study interviews were used not only to supplement information obtained using other methods, but I used exploratory interviews in order to shape my intervention, and evaluative interviews in order to assess its impact and the possible limiting factors. Interviews were complemented by personal communication and classroom observation, to obtain a comprehensive picture of the language dynamics of a multilingual Computer Science classroom.

Various authors (Fontana and Frey 1994 and Frankfort-Nachmias and Nachmias 1996, cited in Dalvit 2004) discuss the use of different types of interviews and their limits as research methods. The preferred interview type in the present study was the focused interview (roughly corresponding to a semi-structured interview). The topic and purpose of the research was briefly introduced and explained. This initiated a dialogue in which the respondents were free to address issues that particularly concerned them. An interview guide (usually in the form of a list of topics) was used to help keep the interview going and to stay "on track".

Focused interviews seemed to suit the exploratory purpose of my research. I tried to strike a balance between flexibility (in order to allow for unexpected information to emerge) and standardisation (in order to follow strong patterns). According to Frankfort-Nachmias and Nachmias (1996:234) this form of interview allows for a deeper exploration of personal responses and emotions. This seemed to be consistent with the self-reflective nature of my research, and with its orientation to assessing and possibly impacting on students' attitudes.

Unlike schedule-structured interviews, semi-structured interviews do not allow for accurate comparison between the responses of different interviewees. Given the use of interviews as exploratory or explanatory tools, comparison did not seem to be a priority. Within the action research approach which informed my study (Kvale 1983; Seidman 2006) , semi-structured interviews allowed me to actively encourage self-reflection on language issues. I feel that structured interviews would have imposed my own patterns of thought and, inevitably, my ideological stand on the students, thus restricting their freedom. At the same time, unstructured interviews would have been extremely time-consuming, with the additional risk of students repeating data that were already clear in the questionnaires, and leading the conversation away from the topics of particular interest. Interviews were not simply used to collect information, but provided a forum for discussion. The semi-structured format allowed me to touch on the important issues while making my point.

Between 2004 and 2007, 40 randomly selected students, tutors and mentors were interviewed. Interviewees were either contacted in class or selected from those who left their details (indicating they would like to be interviewed) in one of the questionnaires. The initial interview guide was

drafted based on critical issues involving the use of African languages in the field of ICT emerging from the relevant literature. Subsequent interview guides were informed by responses to the questionnaire, classroom observation, informal conversation with students and their lecturers and feedback on the implementation. While analysing the interviews, information collected through these additional methods was considered. In particular, informal communication with the lecturer of the course provided interesting insights. Formal interviews and informal communication became moments of discussion and self-reflection. I put every effort into making my ideological stand explicit and creating space for different opinions and constructive debate.

5.2.4 Development of additional teaching material

One of the key features of my research was the development of additional teaching material in African languages. For the reasons discussed above, focus on the lexico-grammatical level seemed the most appropriate in the context of science education. Unpacking of technical terminology seemed to be a key issue, and a glossary of English computer terms explained in the students' mother tongue appeared to be an appropriate intervention.

For the choice of the terms to include in the glossary (Appendix H), different options were taken into consideration. Using word frequency is part of a somewhat outdated research approach in Linguistics (West 1953) and Computer Science (Edmundson 1969). This would have consisted of analysing a text (ideally the handbook used by the students) to see which words were used more often. A common critique of this kind of approach (Jescheniak, Meyer and Levelt 2003) is that the words that are most often used are not necessarily the ones students struggle with, nor the most important to know. With respect to the first objection, I considered comparing the list of most common words with a corpus of isiXhosa English developed by de Klerk (2002) to see which words are common in Computer Science, but rarely used by isiXhosa speakers when they speak English. Still, one could argue that the fact that such words are not used does not imply that isiXhosa speakers do not know them. Perhaps most importantly, reflections on issues of relevance of the words identified in this way convinced me to take a different approach.

Consistent with the Functional Linguistics paradigm, which informed my research, I relied on document and discourse analysis to find out which words were the most important. I went through the Computer Skills handbook used by students and collected all new concepts. Consistent with Halliday and Martin's (1993) findings, new terms were defined as they were introduced in the handbook. I could then use the English explanations as a starting point for the translation. Additional technical terms which formed part of the explanation were also included, highlighting the relationship between different new concepts. I also added some terms which were not in the handbook, but seemed to be important based on classroom observation.

Following the example of existing dictionaries and glossaries, each entry included three components:

1. **A direct translation:** whenever possible, English technical terms were given an equivalent in the students' mother tongue. Regardless of whether these new terms were actually used, I felt that making them available to students would support their understanding. As suggested by Halliday and Martin (1993), it was important to emphasise the new technical meaning of the terms, and not simply to trivialise technical concepts as equivalents of common words.

2. **An explanation:** technical terms needed to be "unpacked", in much the same way that teachers do in the classroom. Using the students' mother tongue was intended to complement English explanations they received in class, or those which were readily available on the Internet or in print, drawing on their full linguistic repertoire. In order for this to be effective, a simple variety of isiXhosa, close to the one actually spoken by the students, needed to be used.

3. **An example:** examples and metaphors are powerful explanatory tools. In line with the *tenets* of the Ethnocomputing paradigm, which informed my research, emphasis was put on drawing on students' daily experience and cultural background. This did not mean using existing concepts and taxonomies *tout court,* but rather using students' prior knowledge to facilitate the creation of new meanings and classifications.

Based on the experience of the dual-medium Bachelor's degree at the University of the North (see Ramani and Joseph 2002), my initial plan was to get students to develop their own material on a voluntary basis. I could foresee that languages with larger numbers of speakers (such as isiXhosa) would progress faster than others. I thought that making participation voluntary would avoid rivalries between speakers of different languages. In fact, if a student felt that his or her language was being neglected, it was enough for him or her to contribute more. Unfortunately, for practical reasons, this system did not work and I had to focus exclusively on isiXhosa.

Another problem in getting students to develop their own material was the issue of quality. Possibly because of the nature and the novelty of the subject, I found that I had to rely on people with a higher level of expertise in order to get material which could actually be used. An interesting experience was the development of a prototype glossary as an Honours project by a CS student at the University of Fort Hare, which I supervised (Sam 2007). For the translation, the student used a Translation Management System called Pootle (Po-based, on-line translation and localisation engine), developed by Translate.org.za. In recent versions, this application keeps track of previous translations and makes suggestions based on a terminology database. The discussion mailing list for isiXhosa, also maintained by Translate.org.za, was extensively used to discuss terminology and translation. Although only part of the glossary was completed and was never actually used in class, this experience highlighted some problems. First of all, quality and commitment could make all the difference between something useful and a pure academic exercise. Secondly, different kinds of expertise were required. On the other hand, the use of on-line tools could greatly facilitate translation and collaboration with other translators

For the final product, most of the terminology development and translation was done by members of the SANTED programme within the African Studies Section of the Rhodes School of Languages, of which I am part. The team includes a variety of people with different expertise (ranging from Computer Science to Linguistics) and different levels of computer literacy. This ensured the production of material which is accurate from both the linguistic and the technical point of view, and which is accessible to people who are still in the process of becoming computer literate. The material was developed through a series of mini-translate@thons, i.e. translations sprints which could last up to a whole day (see Appendix I for an example). Existing terminology

developed by Translate.org.za or made available by the isiXhosa National Language Board was consulted and occasionally used. Students in the focus group were still encouraged to contribute with feedback and by proposing new terms and definitions for review.

5.2.5 System design

In order to enjoy the advantages offered by the use of technology in the promotion of African languages discussed above, the material was integrated into a Web-based application. The selection of the system components was determined by practical problems which emerged during classroom observation. Students tend to rely on each other for help in the classroom. As already observed at lower levels (Setati et al. 2002), most interactions take place in a common African language, if possible. A chat room feature could allow students to interact with each other during practicals. It would also make it possible for students who have finished an exercise to help others. Likewise, an on-line forum could allow interactions between students and their tutors. Just as in oral communication, such interactions could take place either in English or in a common African language. The difference is that, in an on-line forum, once an answer is given to a student it is automatically available to (and searchable by) all the others.

The central feature of my intervention was an on-line glossary. Entries needed to be integrated with multimedia (i.e. audio explanations, video tutorials and images). Various on-line glossary applications are available on the Web, but few of them offer integration with other features such as chat rooms and on-line forums. Moreover, the glossary needed to be instrumented to inform research by:

1. Keeping track of which words students looked for the most.

2. Recording missing words, i.e. words that students looked for but were not in the glossary. These could be added later.

3. Allowing students to rate and comment on existing entries and add more entries and definitions.

The use of FLOSS seemed the best solution for a number of reasons. First of all, open-source software can be easily modified. This allowed me to add the features I needed and modify the software to suit the particular needs of my research and of my focus group. Secondly, open-source software can be freely redistributed. This means that whatever solution I elaborated could be easily deployed anywhere else. Thirdly, as noted above, the use of open-source is consistent with the ideological stand of my research. It would seem inconsistent to try to tackle linguistic dependency while actively enforcing technological dependency, by using proprietary software owned by American companies.

Initially, an *ad hoc* solution was developed using Java. Although it was fully customised and portable, it was bulky and slow, and not very appealing to students. Newman and Lamming (1995) note how, in system design, appearance is as important as functionality. An additional problem of this initial application was that it was not integrated into teaching. At a later stage, the Learning Management System Moodle (Modular Object Oriented Digital Learning Environment) was used. This is a system designed specifically for educational purposes, inspired by the principles of social constructivism. Apart from a fully-featured glossary module, it includes collaborative tools such as chat rooms and on-line forums, as well as questionnaires, wikis, etc. Rhodes University maintains a Moodle server, which is extensively used for teaching and learning. Partly as a result of my intervention, in 2007 Computer Science 1S students started using a Moodle course during lectures and tutorials. This allowed for the full integration of my research tools into the classroom practice.

Moodle is open-source and can therefore be easily customised. Some “tweaks” were necessary to add the functionalities mentioned above. Apart from the use of isiXhosa content, no further effort was made to integrate students' cultural features in the system. First of all, integration in the formal on-line version of the course, although offering clear advantages, meant that I did not have full control over the way the course was presented. Secondly, as noted by Maşoeu and de Villiers (2001), attempts at “Africanising” software interfaces are met with mixed feelings by African users. Linguistic localisation (i.e. translation into an African language) seems to be the most important

factor, and that is the one I focused on. Thirdly, a comprehensive redesigning of e-learning to suit the African context involves deeper changes and more comprehensive reconceptualisation than could be accommodated within the present study.

5.3 Research design

In this section I describe three aspects of my research design. I start with a systematic description of the research process and timeline. I then describe the data analysis and the triangulation between different methods. I end this section with a discussion around issues of validity.

53.1 Research process and timeline

In this subsection I describe my research systematically. Following a chronological order, I discuss the various steps I took in my study, explaining what I did and why. I link such description with the cycles of research which characterise my approach, discussed in the previous subsection. The methods mentioned here (statistical analysis, questionnaires, interviews, content and system development) are discussed in detail in the next section.

In **2004** I took the first-year CS course offered by Rhodes University in order to deepen my understanding of the discipline of Computer Science, and sat in the lessons and practicals of the computer course for foundation students. This allowed me to make informed choices on the technical terms to be included in the glossary I used in my intervention, and to contribute with technical expertise to the creation of definitions. I was able to observe the linguistic behaviour of speakers of an African language in the multilingual CS classroom, and meet some of the students who formed part of my focus group.

In the first semester of 2004 I developed a language attitudes questionnaire (Appendix A) targeting speakers of an African language who were also attending first-year computer courses. The questionnaire was administered in April/May 2004, and served three purposes. First of all, it provided a general overview of the language attitudes of Black first-year students of computers.

Data analysis, which took place during June/July 2004, revealed that some questions were not relevant and could be avoided in the subsequent versions of the questionnaire, while others needed rephrasing. Secondly, the questionnaire was used as an initial contact with students who were interviewed at the beginning of the second semester of 2004. Thirdly, data gathered though the questionnaire informed the shaping of my practical intervention.

Exploratory interviews with foundation students and tutors were conducted in August/ September 2004. The interviews were used to probe the data collected through classroom observation and through the questionnaire. They allowed me to get a deeper understanding of student's attitudes and discuss the best format and possible limitations of my practical intervention. A proof-of-concept application was ready by September 2004. By the end of the year, this was replaced by an *ad hoc* application, which was ready for testing with the students.

In **2005** I got the translation and development of some content in isiXhosa started with the help of a small group of volunteer foundation students. This group also helped to test the *ad hoc* application. Observations during my meetings with the students provided interesting insights on the strengths and limitations of working with volunteers. These determined a subsequent change of strategy in content development.

In the first semester of 2005 I developed two language attitudes questionnaires (Appendices B and C), largely based on the one administered in 2004. One targeted speakers of an African language spoken in South Africa and the other speakers of other languages. Their main purpose was to allow for comparison of the language attitudes of different groups of students. Differences in attitudes were later compared to differences in performance between different groups of students, in order to highlight hegemonic relationships. The two questionnaires run in 2005 also served to probe the findings of the 2004 questionnaire, and to collect contact details for a second round of interviews.

The second round of interviews took place in August/September 2005. The main purpose of these interviews was to probe the findings of the two questionnaires. I also used them to probe the

initial results of statistical analysis of the performance of different groups, although in 2005 such an analysis was still in its initial stages.

In **2006** I analysed statistical data on the academic performance of CS students, selecting and generating knowledge which highlighted hegemonic relationships. Differences in performance between various groups of students were compared with differences in language attitudes to show inconsistencies.

From the point of view of materials development, in 2006 I got more students involved. Mainly because of the contribution of postgraduate students at a neighbouring institution, a prototype glossary was ready by the end of the year. From the point of view of system development I familiarised myself with the Learning Management System used by Rhodes University. I also developed the technical skills necessary to tweak the system in order to inform my research.

In **2007** the SANTED programme started. This allowed for the development of an initial version of the glossary I used for my intervention by March. The glossary was available to foundation students both in print and on-line through the e-learning course set up by their lecturer in 2007. Both versions were instrumented to collect data on their use and feedback from the students. These were used to inform the further development of the glossary, which took place throughout 2007.

In April 2007 foundation students attended a practical using software localised in African languages. In May 2007 Rhodes as well as Fort Hare students were invited to attend a translate@thon to localise the webmail system of the university into isiXhosa. The purpose of these activities was to get students involved in the use and development of ICT resources in their mother tongue.

Two questionnaires were administered: one in March (when the glossary was first introduced to the students) and one in October 2007. The main purpose of the two questionnaires was to highlight shifts in language attitudes as a result of my intervention. They were also used to collect feedback on the glossary, and contact students who might be interested in participating. The second

questionnaire was followed by follow-up interviews. Their purpose was to probe the responses to the questionnaires and allow for some discussion with the students on the intervention. Questionnaires and interviews were used to evaluate the impact of my intervention.

5.3.2 Data analysis

The different methods I used yielded different sets of data. In this subsection I discuss how I analysed them. Statistical data were sourced from the Data Management Unit of Rhodes University, organised in a database and analysed using different statistical packages. These highlighted statistically significant correlations (or lack thereof) between different variables. Percentages and graphs were produced using the basic functionalities of a spreadsheet programme (OpenOffice Calc). Statistical data are used in Chapter 6 to show the difference in performance between various groups of students. This is done descriptively and through comparison between different sub-sets of the sample. The lack of existing comparable data (previous studies, discussed in Chapter 3, were of smaller scale and took different students into consideration) does not allow for comparison with figures in such studies.

Responses to closed-ended questions in the questionnaires were analysed descriptively and comparatively with similar tools to the ones used for the analysis of statistical data on performance. General trends noted in previous studies (discussed in Chapter 3) were taken into account for comparison, while bearing in mind the specificity of the topic (use of African languages in the ICT domain).

Answers to open-ended question and comments in the questionnaires were analysed qualitatively. This large amount of data (see Appendices A – G) was analysed by grouping statements according to themes, which were used to explain, supplement or probe the findings from the questionnaire. This was particularly important in the 2007 questionnaires, where the small size of the sample of respondents made reliance solely on the analysis of quantitative data problematic.

The interviews were recorded. Analysis was conducted by listening to the recordings and taking notes on key issues or interesting ideas. The practice of taking notes without transcribing interviews is not encouraged in qualitative research (Maxwell 2008), but is consistent with the purpose of the interviews in the present study (either exploratory or argumentative/persuasive). The number of interviewees was too small to allow for statistically meaningful inferences. Moreover, during the interview I openly argued in favour of a more extensive use of African languages in education. For this reason, in the analysis it made little sense to focus on the number of respondents who agreed with a particular statement or expressed a particular point of view. I used the interviews to familiarise myself with the students and the key issues they face, and to develop ideas for my intervention.

Data to substantiate my claims about students' attitudes came from the questionnaires rather than from the interviews. Comments to the questionnaires provided the data for a more structured and systematic analysis. Such data was also less likely to be influenced by my own personal bias, which I made clear in the interviews and might have been harder for interviewees to overcome in a face-to-face interaction. Data from the follow-up interviews to the 2007 questionnaires partly served an evaluative purpose. The interviews were conducted and the recordings were analysed together with a colleague from SANTED, with whom I had regular feedback sessions at the end of every interview. However, data on attitudinal shift came primarily from the comments to the questionnaire.

Data on the interactions between the users and the system I used for my intervention were recorded in the system logs. These were analysed through descriptive statistics and presented as absolute numbers. These gave an indication of the kind of terms students looked for and provided some direction for the further development of the glossary.

5.3.3 Validity

In this subsection I discuss issues of validity. Within a philosophy of praxis, the notion of validity needs to be problematised. Researchers who subscribe to this paradigm emphasise the empowering character of knowledge and its role in deconstructing dominant ideologies and bringing about social

change. This entails two potential threats to validity, identified by Maxwell (1998) as bias and reactivity.

According to Maxwell (1998:243), “bias refers to ways in which data collection or analysis are distorted by the researcher's theory, values or perceptions”. Research bias is a serous concern in research such as mine, which is by definition shaped by a specific ideological orientation. Maxwell notes that, particularly in qualitative research, the main concern is not eliminating bias, but rather understanding how it affects the study.

In my research, I made my ideological bias explicit in my thesis and to the participants. In analysing students' performance, I provided a detailed account of my methodological choices in Chapter 6 in order to make any possible bias in the choice of the sample, the indicators and the procedures explicit. In developing the questionnaires, I tried to avoid ideologically loaded phrasing of the questions. Most insights came from comparing responses to the same question by different groups of students, and absolute figures were used descriptively to support my argument. I feel this either eliminated my bias or made it explicit. In the interviews, my ideologically-biased position was the starting point for discussion.

In discussing my intervention, my bias might have led me to overstate students' participation, quality and usage of the material. None of the three could be compared with previously existing data, and their interpretation relied ultimately on my personal judgement. While students' participation could be observed and inferred from the system logs, usage and quality of the material were problematic to measure. As shown in Chapter 8, I worked together with other researchers. Although they might have been similarly biased, discussion around the validity of our intervention was part of our regular interactions. It is also important to note that, given the purpose of my research, students' participation, quality and usage of the material were not as important as students' attitudes. The threat of bias to validity of findings on students' attitudes was discussed in the previous paragraph.

The term “reactivity” refers to the impact a researcher him or herself has on the phenomenon he or she is studying. In the case of my research, one of the purposes of my interactions with the

students, either in class or during interviews, was to generate discussion and raise awareness around language issues. I made my ideological stand clear, and I consider my interaction with the students to be part of my intervention. Since there were no follow-up interviews after the questionnaire run in March 2007, and I had little interaction with the respondents during the year, my presence did not affect the responses to the follow-up questionnaire administered in October.

Maxwell (1998:243-5) proposes a "validity checklist". Some of his suggestions apply to my study. I had intensive, long-term interaction with the students who were at the centre of my investigation over the period 2004-2007. Using different methods, I collected "rich" data which allowed me to portray a detailed picture. I sought respondents' validation through interviews, personal interaction and direct feedback. Discrepancies and triangulation concerned mainly data on language attitudes and, to a lesser extent, usage of the material which formed part of my intervention. Both were handled mainly in the interviews. I made explicit use of quasi-statistics, together with qualitative analysis of comments and interview responses to support my claims. This was particularly useful with reference to the 2007 questionnaires, since the sample of respondents was small. Comparison with other studies and between different data from my study was minimal, but present whenever possible.

5.3.4 Reflections on research design

In this subsection I reflect on the general challenges relating to my research design. Most of these challenges derive from the exploratory and multidisciplinary nature of my research. Challenges specific to the various research methods I used are discussed in the next section.

This being an exploratory study, to some extent its goals and my design became clear during the research process. Maxwell (1998) notes that, particularly within an action research approach, the research design needs to be flexible, and some decisions regarding methodology can only be taken during the process. This was imperative in my research, partly because of practical considerations (e.g. the foundation programme was restructured in 2005), and partly because the level of institutional support for African languages at Rhodes University has changed considerably in recent years.

Possibilities of expanding my research which could not have been foreseen in 2004 presented themselves along the way. In 2006, I started the collaboration between Rhodes University and Translate.org.za. This encouraged me to align my research and create synergies with this NGO by relying on the terminology they used and taking advantage of the resources maintained (e.g. mailing lists) and tools (e.g. Pootle) developed by the organisation. This collaboration entailed some reworking of my design, but I feel it had a positive influence on the status of African languages at Rhodes mainly because of the media coverage of the translate@thon held in May 2007. Although the direct impact of this event on my research cannot be quantified, its contribution to the overall goal of challenging English linguistic hegemony justified my reworking of the research design.

Since 2007, the new leadership of the university has made institutional transformation one of its priorities (see Badat 2008). In the same year, the SANTED programme started within the School of Languages. This programme provided not only the funding but also the impetus for implementing the university's language policy, which envisages, among other things, the promotion of the role of isiXhosa (see Kaschula et al. 2008). These events justified a reworking of my research design to take advantage of the new possibilities for the promotion of the use of African languages at the institutional level.

Such reworkings based on events external to my research might give an impression of opportunism and raise questions about my research design. In response to that, I would say that, although the details could not be foreseen, the three events mentioned above were part of a general trend which, to a researcher in the field, was evident already in 2004. I feel it was appropriate to sacrifice some of the clarity and organisation of my study in order to follow the opportunities of social and institutional change. This is in line both with my research approach (i.e. action research) and with my research paradigm, which emphasises the close and dialectic relationship between research and social change.

The multidisciplinary character of my study reflects its topic, at the crossroads between Education, Linguistics and Computer Science. I feel that my own multidisciplinary background allowed me to carry out an original piece of research, and combine a wide range of different methodologies. This made some of the concepts traditionally used in research methodology, e.g.

triangulation, applicable only to some parts of my study. However, the use of different methods and perspectives allowed me to get a multifaceted, though somewhat sketchy, understanding of the situation of speakers of an African language in CS from the point of view of linguistic hegemony. This is consistent with the case study type of action research which characterises my study.

Different aspects of my research could have been developed into stand-alone PhD studies. This could provide some direction for further research, in which particular aspects of the present study could be expanded within a single disciplinary perspective. This would no doubt present a clearer design and lead to more conclusive findings than the present study. However, I feel that in the period 2004-2008, more "conventional" pieces of research would not have allowed for the dialectic relationship with institutional change which characterised the present one.

5.4 Challenges

In this section I discuss the various challenges I faced in my study. I start by highlighting the practical challenges connected with the use of the various methods discussed in the previous two sections. I then take into account ethical considerations. I conclude by problematising my role as a researcher. The purpose of this section is to discuss the limitations and problems encountered during my study and, whenever possible, the strategies I employed in trying to overcome them.

5.4.1 Methodological problems

Each of the methods I used entailed specific challenges. The main issue in the statistical analysis was to find an appropriate indicator for the students' linguistic background. Home language, race and having written English as a first or second language in Matric all seemed to be unreliable, so a combination of various indicators had to be used. Identifying data relative to members of particular groups (e.g. middle-class Black students) was also problematic, since data on the economic status of the students were not available. I relied on a combination of different indicators to make an informed guess.

Data were easily obtained from the Rhodes Data Management Unit, but some were incomplete. The structure of various Computer Science courses changed in the period taken into consideration. Due to the normal turnover in the university staff and the changes in the syllabus, students attending the same course in different years inevitably ended up being taught by different lecturers and studying a different curriculum. From a strictly quantitative point of view, these changing factors might be seen as making statistical comparison and analysis difficult. If one takes a more holistic approach, however, such changes could all be seen as steps in the natural transformation of the academic institution. Since the focus is on comparison of students in the same course at any given time, statistical analysis can yield interesting insights on how changes either favour or counter equality among students.

The computer course for foundation students was run by the Computer Science Department until 2004, but was later substituted by an in-house course run by the Extended Studies Unit. This entailed change of lecturer and a few structural changes. From the point of view of my research, the most interesting thing about the change of lecturer is that an isiXhosa-speaking lecturer was replaced by a Chishona speaker. This allowed for the comparison of two different situations, one in which the lecturer shared the same language as half of the class, and the other in which the lecturer, although a speaker of an African language, could rely only on English. In both scenarios, most of the tutors were isiXhosa speakers.

From the structural point of view, in 2005 students were separated into smaller groups according to faculties. This also entailed the development of new, discipline-specific curricula. As a result of these changes, I was able to target only students in the Science Faculty, who had a higher chance of continuing their studies in Computer Science, for my intervention. Another significant change is that, before 2004, foundation students who attended the computer course could enrol straight for CSc102, while after 2004 they had to cover the same curriculum again (although in more depth) in CSc101.

The working, order and type of questions use in the questionnaires, as well as their sample, changed over the years. This makes comparisons across different years complicated, and, in the case of a few questions, impossible. Within a survey approach, this would be seen as a problem.

However, within the action research approach which shaped my research, questionnaires served other functions besides the collection of data. First of all, responses from the questionnaires were used to inform my intervention and the design of the system. Responses were interpreted quantitatively as well as qualitatively, and, necessarily, questions had to change to adapt to the evolving system and the different conceptualisation of the intervention. Secondly, questionnaires were used as occasions to encourage students to reflect on language issues. In this case, the Hawthorne effect (see Jones 1992), according to which a researcher inevitably changes the situation he or she is trying to research, was not seen as a problem but as an integral part of the research. Thirdly, in all my interactions with the students, I tried to make my ideological stand as explicit as possible. The questionnaires became occasions to explicitly foster in the students' minds the idea that using an African language alongside English as an additional LoLT for Computer Science is possible.

I feel that interviews were affected by two sets of limitations. First of all, the fact of not being a native speaker of isiXhosa put me at a disadvantage. More than for practical communication reasons, this was an ideological problem. Given the topic of the research, i.e. the promotion of African languages, it was ironic that interviews had to be carried out in English. While communication problems could be taken care of with the help of an interpreter, I felt that not sharing the same mother tongue as the respondents limited the kind of rapport I could have with them. With respect to this, I tried to emphasise the fact that I am not a native speaker of English, and that I had to face comparable challenges to the ones they were facing.

The second limiting factor was time. Although all staff members tried their best to accommodate my research, foundation students have a very busy schedule, and it was not easy to find a suitable time for interviews. This resulted in interviews being carried out during the week-long break at the end of the year. Although very close to the exams, this is the only time in which students are on campus but are not busy with lectures and tests.

In the development of the material (a glossary of technical terms translated, explained and exemplified in isiXhosa), quality was a key issue. Because of the historical association of African languages and mother-tongue education with inferior quality and marginalisation, substandard

material could have reinforced the existing negative attitudes. For this reason, every effort was put into presenting students with a glossary of good quality. Getting students to develop such material from scratch, although an interesting experiment, resulted in poor quality. The output of an Honours project in Computer Science, while bringing in more technical expertise, was still not satisfactory from the linguistic and educational point of view. In order to ensure quality, I had to rely on a multi-disciplinary team within a university project. For obvious reasons, this model was less flexible and more difficult to replicate. One of its practical implications was that only material in isiXhosa could be developed. In order to avoid duplication of the effort, we worked in close cooperation with the isiXhosa National Language Body and with Translate.org.za. However, different views on terminology development and quality assurance emerged and created tensions. Although their management goes beyond the scope of my research, they are definitely an important issue in the promotion of the African languages.

Once the material was developed, a key issue was to get students to use it. At first I used web-based applications to deliver the content. Particularly in an educational context the integration of web-based applications to support classroom practice, in spite of its transformative potential, is not unproblematic (Garrison and Kanuka 2004). In general, students seem to be reluctant to use additional material which is not part of their formal syllabus. In the case of my research, I was faced with two additional challenges. First of all, such material was in a language which is not conventionally used in classroom teaching and whose use, one could argue, is covertly discouraged by the institution, and particularly in the foundation programme. Finding possible ways to counter this attitude was an integral part of my research. Secondly, for the first three years, I had to use a specifically designed application students were not familiar with. In 2007, classroom teaching for Computer Science 1S was integrated with an on-line Moodle course. This allowed for the integration of the glossary which formed a core component of my intervention into an application students used in class.

The use of an e-learning system in which the material I developed could be integrated allowed me to overcome another problem: the fact that most students in the focus group were not familiar with computers and with the use of Web-based applications. Having to use the application as part of their course gave the students the necessary motivation to familiarise themselves with it. I used two

additional strategies in order to tackle this problem. First of all, the material was introduced after a few months from the beginning of the course, when students are supposedly familiar with the use of the Internet. Secondly, the on-line version of the material was integrated with a print version that students could use in their own time and outside the computer laboratory.

5.4.2 Ethical issues

During the research process, I had to take several ethical considerations into account. Foundation programmes are strategically important for South African universities at the moment, given the emphasis from the government on access to higher education for members of marginalised communities. Students in such programmes are therefore the focus of much research in a number of disciplines, ranging from Education to Sociology, from Linguistics to Economics. In the words of the programme coordinators, students in the Rhodes SESP are "over-researched". In 2007 alone, foundation students were asked to take part in surveys in Linguistics (Aziakpono 2008) and Journalism. For this reason, I tried to minimise the impact of my research, demanding as little time as possible from the students. This posed some limitations to the amount of interaction I could have with them, and to the amount of information I could gather. Although this entailed a more "diluted" action research, I felt it was important in order to keep a good relationship with the students.

A number of strategies were considered to make participation in the research more meaningful for students. Offering rewards in terms of money or equipment is commonly used to increase participation (Singer 2002). In this case, I felt this was not appropriate, for two reasons. From the practical point of view, it is doubtful whether such strategies would work. Informal communication with students indicated that, in the case of random prizes, students would assume someone else would get them, while in the case of assured rewards (i.e. small sums of money, airtime etc.), the offer introduced considerations such as the trade-off between time required and perceived benefits. From the ideological point of view, it seemed ethically unsound to use material reward as a motivation. Because of the topic, i.e. attitudes towards the promotion of African languages, I felt that trying to inspire students by highlighting the importance of the study was a much better strategy. This allowed me to consider participation (or lack thereof) as an additional variable.

Students were fully informed at all times of the purpose of the research and of their role in it. In an attempt to increase motivation, the intervention was contextualised as the testing of a model that could be used at lower levels and for languages other than isiXhosa. This was intended to motivate isiXhosa-speaking students as contributing to the wider community of isiXhosa speakers, and particularly to people from their same background. At the same time, it was a strategy to show the possible benefits of the research for the promotion of all South African languages. As mentioned above, this has emerged as a key issue in the debate on the use of African languages in education. Questionnaire surveys were repeated cyclically, but the results from the questionnaires and the interviews were not made available to the students so as not to influence their answers. At the end of the research, a summary of the results will be made available on the Web, and every effort will be put into reaching the participants directly via e-mail, notifying and thanking them.

The material was presented as additional teaching material, and it was made clear to students that its use was optional. The possibility of integration in the curriculum or assessment, even informally, was therefore ruled out. Although this prevented me from exploring a potentially very interesting dimension of the research, it was intended to address the concerns by both staff and students that the use of African languages might become compulsory or even substitute the use of English. This was particularly important since, from 2005 onwards, the Computer Science 1S lecturer was a speaker of Chishona with little knowledge of isiXhosa. With specific reference to action research, Avison et al. (1999) note the importance of taking the specific interests of the people involved into consideration. In this case, although the lecturer supported my intervention fully, it is understandable that the possibility of a more extensive and formalised use of isiXhosa could be perceived as potentially disempowering for him.

Foundation students are academically “weak” by definition, and their first year is very important. One must therefore be very careful in planning interventions which could potentially impact on their academic performance. While taking into consideration the “access paradox” (see Janks 2000, mentioned above), i.e. the fact that facilitating access to powerful discourses inevitably entrenches their hegemony, I was concerned that proposing an alternative might actually have a negative impact on the students' performance. Using material in isiXhosa, while potentially helpful, could have created false expectations and shifted students' attention away from English, which remained

the only language of assessment. In other words, while the benefits of mother-tongue instruction are emphasised by psycholinguistic theory, I was not prepared to undertake the responsibility of encouraging students to rely too heavily on the material in their language. My fear was that possible drops in students' performance, whether related to that or not, could be blamed on my intervention. For this reason I left the choice of whether to use the material or not to each individual student, and I tried not to push too much in either direction.

5.4.3 Role of the researcher

Unlike researchers in some of the studies mentioned above (Dyers 1998; Ramani and Joseph 2002; Dambisya and Modipa 2004), I was not directly involved as a lecturer in the class which forms my focus group. This had both positive and negative effects. On the positive side, it allowed me to be more objective. Not having authority over the students in my focus group arguably put them in the position of expressing their attitudes more freely, and reduced the impact of my ideological bias. As an external action researcher, I felt that I needed to make my ideological stand as explicit as possible, while allowing ample space for discussion and different ideas. On the negative side, it prevented me from gaining the deep understanding of the classroom dynamics and the students' situation which only someone who has constant contact with them has access to. Not having an institutional role in the classroom limited my possibilities of intervention. Although both staff and students have always been very accommodating towards my requests, I felt the need not to impose my presence more than was necessary.

Not being directly involved with the teaching emphasised my role as an outsider. Unfortunately, this was already marked by other factors. First of all, I am a White male. Although, being a foreigner, I have never experienced Apartheid, it seems only natural that, consciously or unconsciously, students would identify me as a “kind of” White South African. This has a number of associations (of status, class, ideology) which do not necessarily match my own. While I feel that gender played against me (being a female would have allowed me to establish a more empathic relationship), the fact that English is not my mother tongue proved to be an asset. Both in designing the research and in my interaction with the students, being speakers of English as a second language created a basis for common understanding. I had to bear in mind at all times that my background

and the way my first language contributes to my English proficiency is radically different from that of an African student. However, in arguing in favour of the use of African languages, I could draw on my personal experience as a native speaker of Italian and as a former exchange student in Norway and Finland. I could use any of Italian, Norwegian or Finnish as examples of languages which are not internationally used, but have been fully developed for the ICT domain. Finnish in particular, being a comparatively small and a non-Indo-European language, was often cited.

During the course of the research, I have learnt isiXhosa up to a level of basic proficiency. My live-in partner at the time in which the research started was an isiXhosa speaker, and I feel that equipped me with useful linguistic and cultural insights. In 2006 I took isiXhosa 1 as a second language as an additional credit. This contributed to my formal understanding of the language and its grammar. In 2007 I have been working in close contact with isiXhosa speakers within the SANTED programme. Although my proficiency in the language does not allow me to use it as a research tool, I am able to follow most conversations between native speakers (especially in a restricted domain with many English borrowings such as that of ICT). I feel I can contribute to translation and terminology development, partly drawing on my formal background in linguistics coupled with my technical knowledge. In my interaction with the students, my isiXhosa is useful mainly for symbolic purposes, as a "sign of respect". In most cases, after a few sentences, the conversation switches to English for the sake of communication.

The progress of the research was inevitably intertwined with my personal development, and was affected by my personal experiences in the past four years. Many of them had intercultural communication as a background, and I feel they contributed to my research by giving me a more refined and articulate understanding of cultural, linguistic and power issues. Another personal factor which affected my research is the fact that I am visually impaired. This made it quite difficult to establish a social relationship with students, since it was quite difficult to recognise them when I met them outside class. Those who contributed to the project, however, knew about my problem and understood. The default white background on most desktop computers is problematic for me, and I need to use computers in accessibility mode, i.e. with inverted colours. During classroom intervention, I relied on the help of tutors and members of the SANTED team to overcome this problem.

5.5 Summary and conclusions

The three main components of my research (i.e. educational, linguistic and technological) were informed by three different but related paradigms. While critical pedagogy, informed by Gramscian educational theory, provided the ideological framework, Ethnocomputing and Functional Linguistics shaped its implementation. This allows me to tackle one of the critiques levelled at critical theory, by foregrounding transformation rather than criticism of the *status quo*. Students in the focus group are seen as organic intellectuals with the potential of transforming both the discipline of Computer Science and their society at large, once given the necessary tools. This addresses the second critique of critical pedagogy, i.e. its prescriptive character, which relegates learners to a somewhat passive role.

Due to its practical orientation, the action research approach seemed the most appropriate for this kind of research. Statistical analysis and survey-type methodologies were used to inform practical intervention and reflection. I took a comprehensive, case-study approach which involved the use of a variety of methods. Statistical analysis of the performance of CS students according to language and various other factors was used to obtain a clear picture of the situation. Questionnaires and interviews were used as exploratory, informative and evaluative tools. Within my action research, these were occasions for discussion and promotion of awareness around language issues. The development and implementation of the material were guided by the goals and were situated within the ideological framework of the research. Consistent with an action research approach, the process was cyclical, and each phase was informed by the preceding ones.

In my research I encountered and tried to overcome a number of limitations. Personal limitations included my role as a researcher as well as a sight problem which affected my interactions with the students. A number of challenges were specific to the various methods used. Heterogeneity of the data and reliability of the indicators affected the statistical analysis. The evolution of the questionnaire over the years made quantitative comparisons of the data difficult. Interviews were affected partly by some of the personal problems mentioned above, and partly by issues of timing. Quality was a concern in the development of the material. Usability and course integration were important concerns in the design of the system. Within the action research paradigm, finding ways

to tackle these limitations became an integral part of the research. Finally, I was faced with ethical issues such as the risk of creating false expectations among students and countering concerns among staff. Most of these related to the possibility of replacing English with an African language which, at this stage, is neither possible nor advisable.

CHAPTER 6: LANGUAGE AND ACADEMIC PERFORMANCE

In this chapter I highlight the poorer performance of speakers of an African language compared to English speakers in Computer Science. By looking at different indicators and focusing on different groups of students, I show that the disadvantage encountered by Black students is not eliminated by better educational background or by remedial strategies such as the foundation programme. In the first section I provide the necessary background on the composition of the sample (and of its sub-samples) on the mainstream CS courses and on the students' matriculation results. Background information on the three is important in order to understand the impact of language (as opposed to other factors) on performance, discussed in the second section. In the third section I focus on different groups of Black students. Data presented in the third section further shows that educational background and remedial strategies such as the foundation programme do impact on the performance of Black students, but do not allow them to compete on an equal footing with White students.

6.1 The sample

I start this section with an overview of the composition of the sample in terms of various background variables. In the process I refine the sample, motivating my focus on South African speakers of English and of an African language who wrote their Matric in South Africa and are mainstream students of Computer Science. At the same time, I highlight inequalities in the representation of speakers of an African language in this field of study. I then examine the composition of the sample in terms of marks and number of enrolments in different courses and in various years. I finish with an overview of Matric results, since they are the main criteria to determine acceptance into university.

6.1.1 Composition of the student population

In my statistical analysis, I took into account all Rhodes students who took a computer course (Computer Skills, Computer Literacy or Computer Science) in the years 2001 – 2006. This amounts to a total of 5175 students.

The number of male and female students was roughly equal. This data is consistent with the equivalent figure for the whole university, but seems somewhat surprising, since Computer Science is considered a typically male-dominated discipline. The data for gender are not central to my study, but are used later in this chapter for comparison of factors influencing performance.

As shown in Figure 1, most students (76%) were South African citizens. The comparatively high percentage of foreign students is consistent with Rhodes's international orientation. Foreigners went through different educational experiences compared to South Africans before coming to Rhodes. Grouping them together with South Africans would have been problematic. Foreigners (both Black and White) were likely to have very different levels of computer literacy and English proficiency when they came to University. In the rest of the discussion, only South African citizens are considered.

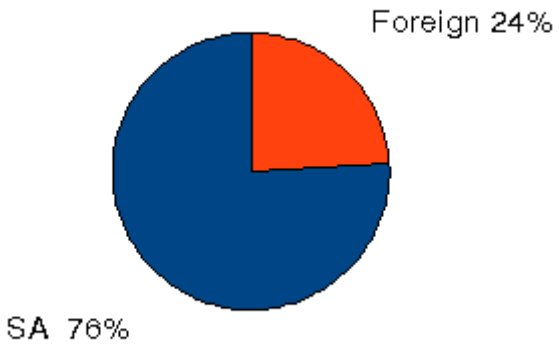


Figure 1: CS students 2001 - 2006 by citizenship (n=5175)

Among the 3927 South African citizens, White students were the majority (56%) and Blacks were a minority (31%). Asians and Coloureds together accounted for 13% of the sample. Asian and Coloured students represented a relatively small portion of the sample. Therefore, they were not considered in the statistical analysis.

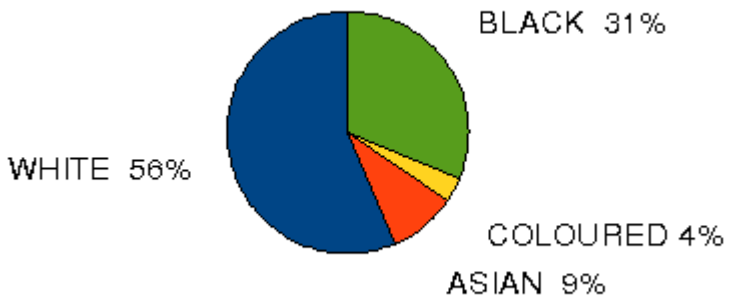


Figure 2: CS students (SA citizens) by race (n=3927)

Speakers of Afrikaans and languages which are not official languages in South Africa constituted a tiny minority (3%) of the South African students. Figure 3 shows that, of the remaining 3355 students, 66% indicated English as their home language. Among speakers of an African language, the majority were speakers of isiXhosa (22%). It is worth noting that, although Rhodes is situated in a predominantly isiXhosa-speaking area (according to Statistics South Africa 2001, 83% of the population of the Eastern Cape Province speaks isiXhosa), only one-fifth of the students in the sample indicated it as their home language. Speakers of other African languages constituted 12% of the sample.

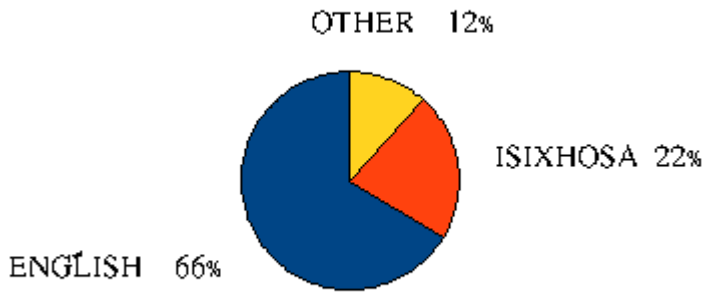


Figure 3: CS students who spoke English or an African language 2001 - 2006 by home language (n=3355)

Contrary to the stereotypical view of Computer Science as a discipline dominated by White, English-speaking males, the percentages presented in this subsection seemed in line with the figures for the university as a whole. This can be explained by the fact that some first-year courses (i.e. CSc1L and CSc101) are taken by a large number of students from all faculties. Computer Literacy (CSc1L) attracts students from all faculties, and Computer Science 101 (CSc101) is a prerequisite for Information Systems 2, a popular course for both Science and Commerce students. In order to obtain a useful subsample for the comparison of the academic performance of speakers of English and of an African language in the field of Computer Science, only mainstream undergraduate students of Computer Science are considered from this point onwards.

6.1.2 Enrolments and marks

In the six-year period 2001 - 2006, the students who were South African citizens, either Black or White, and indicated either English or an African language as their home language, enrolled for a total of 2953 undergraduate CS courses.

My assumption was that some courses would prove to be more "difficult" than others. I expected a generally high drop-out rate in first-year introductory courses, since most students did not know what the course would entail and what standard to expect. CSc102 is the first course in the Computer Science curriculum to focus on programming. It was therefore reasonable to assume it would be a stumbling block. Based on informal communication with the students, CSc201 was considered a difficult course. Verifying these assumptions proved to be necessary for the analysis of the differences between speakers of English and of African languages in the following sections.

Table 2 provides a breakdown of the enrolments. First-year courses, and in particular Computer Science 101 (CSc101), accounted for most of the enrolments (65%). The fact that CSc101 is part of both the Computer Science and the Information Systems career might account for the surprisingly low percentage (33%) of students who continued from CSc101 into CSc102. Only 62% of the students continued from 1st into 2nd year Computer Science as opposed to 93% who continued from 2nd into 3rd year.

Table 2: enrolments 2001 - 2006 by course

Level	Course	Nr	%	Continuing %
1st year	CSc101	1440	49	
	CSc102	482	16	33
2nd year	CSc201	297	10	62
	CSc202	252	9	85
3rd year	CSc301	234	8	93
	CSc302	248	8	106
Total		**2953**	**100**	

Table 3 shows the differences between the minimum, average and maximum mark for each course, as well as the relative standard deviation. First-year courses had generally lower minimum marks and slightly lower pass rates compared to later courses. The high standard deviation in CSc102 suggests a large spread in the students' achievement in this course, meaning that some students performed very well and others very badly, with fewer marks grouped around the average compared to other courses. CSc201 and CSc302 seemed to be difficult courses. This is supported by the comparatively low pass rates for both courses as well as the low minimum mark of CSc201 and

average mark of CSc302. Failures (and therefore repetitions) in CSc302 might account for the fact that enrolments in CSc302 exceed those in CSc301, as shown in Table 2 above.

Table 3: Minimum, average and maximum mark, plus standard deviation and pass rate, by course

COURSE CODE	Minimum	Average	Maximum	Standard Deviation	Pass Rate
CSc101	15	64	96	12	93
CSc102	11	64	98	17	88
CSc201	28	60	94	14	93
CSc202	36	64	89	10	98
CSc301	35	63	89	10	98
CSc302	32	58	90	11	94

Data presented in this subsection confirmed that first-year courses made up for a large portion of the enrolments. Performance in different years and courses was comparable, though some courses (e.g. CSc101, CSc201 and CSc302) seemed more difficult than others. These figures are not particularly meaningful in themselves. However, they are used as a benchmark for later comparison between speakers of English and of an African language in terms of academic performance in Computer Science. .

6.1.3 Matriculation results

Matriculation results are considered good predictors of academic performance. Like many other institutions, Rhodes University takes into account the overall performance in Matric as well as performance for specific subjects to determine the admission of students. For the purpose of this study, I paid particular attention to results for Mathematics, Computer Studies, English and first languages. Matriculation exams vary considerably across countries, and in some cases it is difficult to compare (or even obtain) the data. For this reason, only results for South African matriculation exams have been considered.

Rhodes uses the Swedish point system to calculate the aggregate of Matric results. A certain number of points is allocated for the first six subjects according to mark and grade (i.e. 8 for an “A” in Higher Grade, 6 for an “A” in Standard Grade, 7 and 5 respectively for a “B” and so on). A minimum of 35 Swedish points (roughly equivalent to an aggregate “C”) is required to enrol in the Science Faculty. A pass in Mathematics at the Higher Grade is a requirement to enrol in Computer Science. Although proficiency in English is a general requirement for admission to university, there is no specific threshold to enter Computer Science.

For the 1339 students who wrote their Matric in South Africa and for whom results were available, C was the average aggregate mark. Figure 4 shows the distribution of symbols for the Matric aggregate, the students' first language, English, Mathematics and Computer Studies (for those who took them). It is important to note that the columns in Figure 4 all refer to different samples.

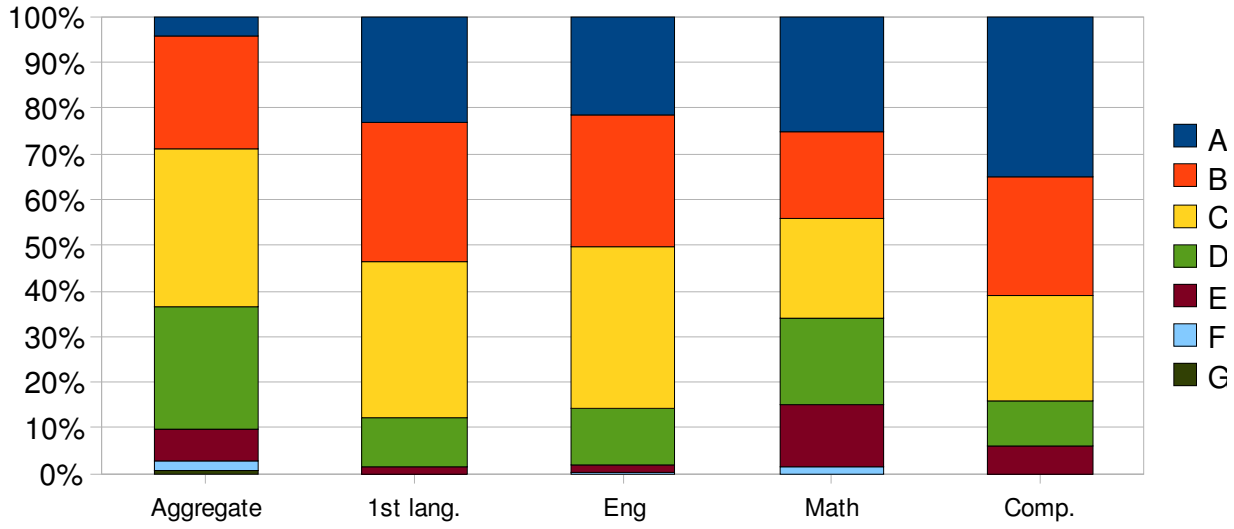


Figure 4: Matric results (different samples)

The figures for the Languages, Mathematics and Computer Studies require clarification. For both Mathematics and Computer Studies, the figures above group together Higher and Standard Grade results. Some of the students (23%) appeared to have taken Mathematics at Standard Grade. These might be students who came from schools where Mathematics was not offered at Higher Grade, and whose marks have been upgraded from Standard to Higher Grade. This is done following a standard

university procedure (i.e. subtracting 2 Swedish points from the Standard Grade mark). Figure 4 above shows that 6% of the students failed Mathematics. Some of them might have been non-continuing students who only needed a credit in CSc101. Computer Studies was taken by comparatively few students (20%). Out of the 285 students who wrote Computer Studies in Matric, 81% took it at a Higher Grade and the remaining 19% at a Standard Grade.

The majority (88%) of the students wrote English as a first language in Matric, and only 12% wrote an African language as a first language and (in most cases) English as a second language. Figure 5 shows the distribution of symbols for English as a first language and as a second language. Not surprisingly, given the large proportion of EL1 students, figures in the first column resemble those for first language in Figure 4 above. Figures in the second column, relating to English as a second language, reflect a higher concentration of Ds and Es at the expense of As and, to some extent, Bs.

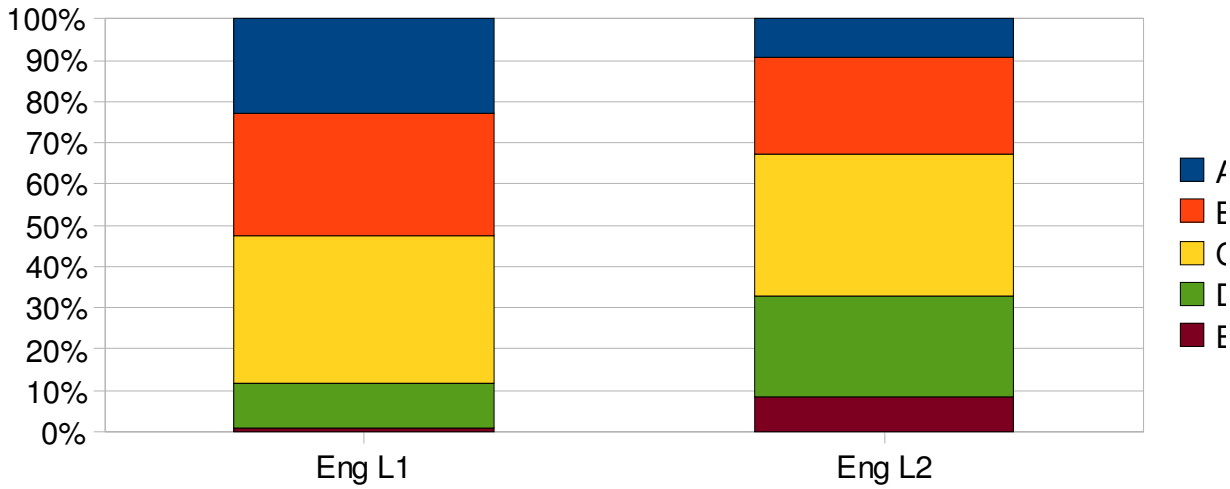


Figure 5: Symbols for English as a first and second language in Matric (n=1339)

In summary, Matric results highlight two interesting findings. First of all, not all mainstream CS students had a pass in Mathematics at the Higher Grade. Secondly, and perhaps more interestingly, the vast majority of the students wrote English as a first language in Matric. Those students who wrote it as a second language, besides arguably having lower proficiency, also got generally lower marks for it.

6.2 The impact of language

In this section I explore the relationship between language and performance in Computer Science. I start with a discussion on the use of race as opposed to home language as a variable. I then explore the correlation between performance and language, compared with other variables (e.g. Matric results for Mathematics, etc.). I finish with a description of the differences in achievement and longevity between White, South African English speakers and their counterparts who speak an African language. In the case of African language speakers, I distinguish between those who attended EL1 and EL2 schools.

6.2.1 Home language as an indicator

In order to classify students as speakers of English or of an African language, race proved to be a better indicator than self-reported home language. Research on language attitudes (see de Klerk 1996) suggests that the use of the home language given by students at registration as an indicator of the language they are most proficient in can be problematic, because of a tendency among speakers of an African language to indicate English as their home language.

The 911 White students (67% of the 1362 mainstream and continuing foundation students in the sample) were by definition English speakers, since speakers of other languages (e.g. Afrikaans) had been excluded from the sample earlier on. The 451 Black students (33% of the sample) were linguistically heterogeneous. Two-thirds of them (278, or 62%) wrote English as a first language in Matric and only one-third (173, or 38%) wrote it as a second language and wrote an African language as a first language. Only 23 (5%) Black students indicated English as their home language and almost all of these (21) wrote English as a first language in Matric.

Table 4: Black students by home language and first language in Matric

	EL1	**%**	**EL2**	**%**	**Total**	**%**
English	21	8	2	1	23	5
Other	257	92	171	99	428	40
Total	**278**	**100**	**173**	**100**	**451**	**100**

Grouping of Black EL1 students with other speakers of an African language was supported by similar marks for English (either as a first or second language) in Matric. Figure 6 shows that the distribution of symbols for English as a first language among Black EL1 students resembled the distribution for English as a second language among Black EL2 students (second and fourth column respectively). The distribution of symbols for English as a first language among English speakers, on the other hand, resembles the distribution of symbols for the first language of Black EL2 students (first and third column respectively).

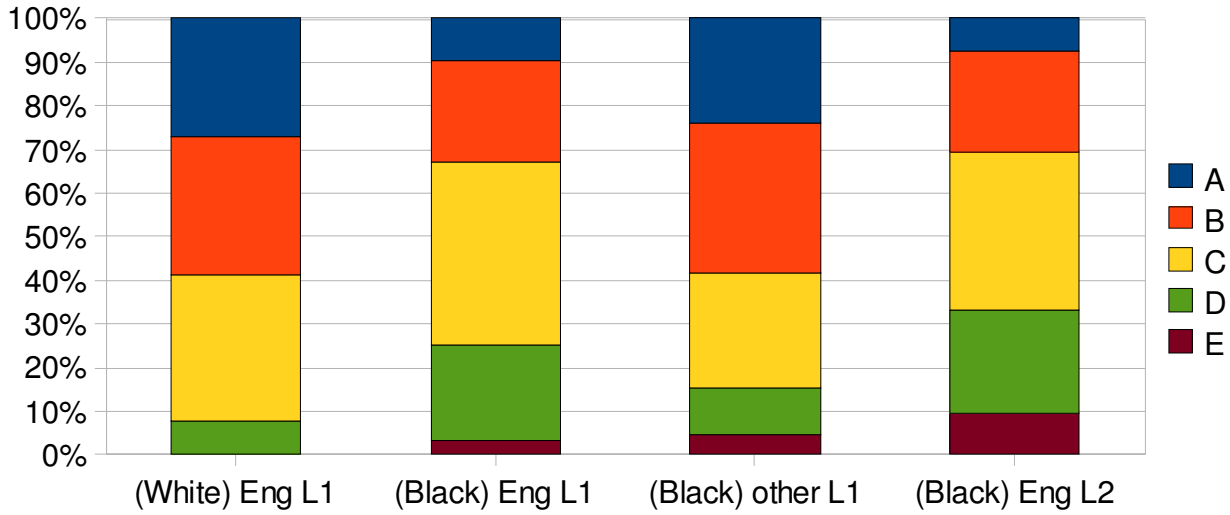


Figure 6: Matric symbols for first and second languages by race (n=1362)

Based on the data presented so far, it is reasonable to assume that Black EL1 students should still be regarded as second language speakers, and not as native speakers. Not many Black students indicated English as their home language.

6.2.2 Language and performance

The only reliable indicator of English proficiency, available for all students in the sample, was their mark for English in Matric. One must be careful to differentiate between those students (Black or

White) who wrote English as a first language (EL1) and those students (mainly Black) who wrote it as a second language (EL2), as well as between speakers of English and of an African language.

Table 5 shows the minimum, average and maximum mark, as well as pass rate in Computer Science, for speakers of English (who attended EL1 schools) and of an African language (who attended either EL1 or EL2 schools). While minimum and maximum marks are comparable, average mark (55) and pass rate (79%) are lower for speakers of an African language than for speakers of English (66 and 93% respectively). This suggests that, while individual students who were at either end of the mark continuum in each group had similar marks (either good or bad), the achievement of the majority of the students differed according to language.

Table 5: Marks and pass rate by home language and first language in Matric

	Lang	Min	Avg	Max	Pass*
English	EL1	11	66	98	93
	EL1	13	57	92	84
African	EL2	15	54	80	72
Language	Total	13	55	92	79

Table 6 also shows that, among speakers of an African language, the average marks for EL1 students were closer to those for EL2 than to those for native English speakers. EL1 Black students achieved a higher maximum mark (92) and had a better pass rate (84%), but at the same time scored the lowest mark (13%) among Black students. This would suggest that some of the students in this group performed well, while others performed very poorly. Having written English as a second language in Matric seemed to prevent EL2 Black students from achieving high marks, but did not affect their average performance.

In terms of academic longevity, i.e. progression to later years of study, pass rates for individual courses are particularly important. Table 6 below shows that pass rates for speakers of an African language were consistently lower than for English speakers. The difference was particularly striking in courses which, based on previous findings, were considered difficult, i.e. CSc201 and CSc302. Black EL2 students had higher pass and continuation rates in most courses.

Table 6: Pass and continuation rates for different courses by language

	(White) EL1		(Black) EL1		(Black) EL2		Black	
	Pass	*Cont*	*Pass*	*Cont*	*Pass*	*Cont*	*Pass*	*Cont*
CSc101	93		83		61		75	
CSc102	*80*	*36*	*47*	*18*	*63*	*32*	*54*	*23*
CSc201	80	65	42	53	48	65	46	58
CSc202	*94*	*90*	*81*	*62*	*100*	*73*	*93*	*68*
CSc301	93	93	81	100	79	117*	80	110*
CSc302	88	103*	53	106*	41	114*	45	111*

* Continuation rates above 100% are due to transferring and repeating students.

If repeating students were not taken into account, the percentage of Black students would have decreased as the level of a course increased, from 33% in CSc101 to 19% in CSc302. Among Blacks, the percentage of EL2 students remained fairly constant, ranging between 11% and 14%. The overall decrease in percentage was largely due to EL1 Black students leaving Computer Science, as shown in Figure 7. EL2 Black students were less likely to repeat or drop Computer Science courses than EL1 ones.

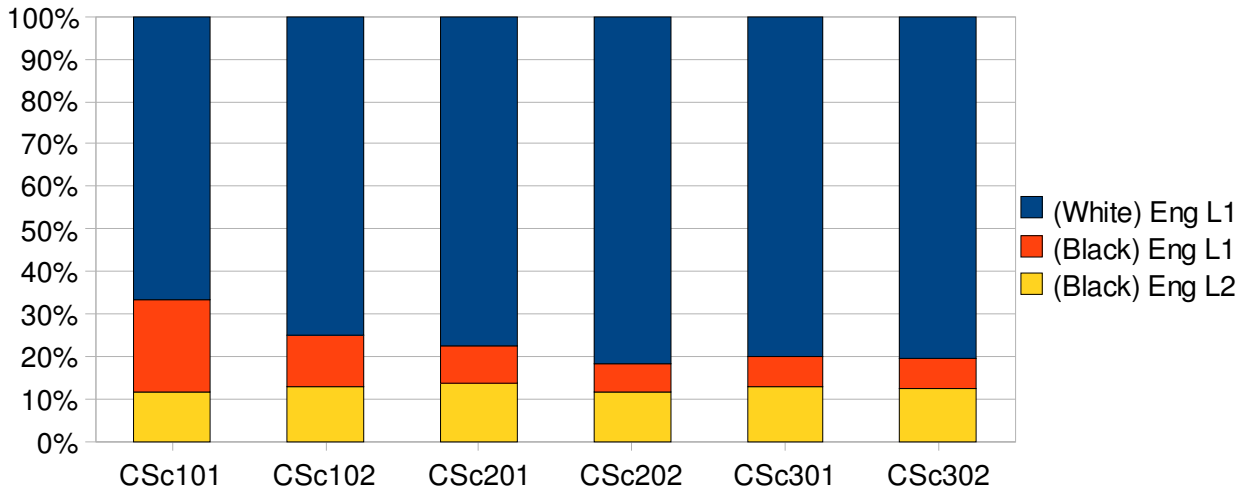


Figure 7: Percentage of Students in Courses by Language

The data presented so far suggests that Black students performed poorly compared to English speakers in Computer Science. This concerned both their achievement in terms of marks and their representation in second- and third-year courses. Contrary to expectations, EL1 Black students did

not perform substantially better than their EL2 counterparts in terms of marks. In terms of longevity, i.e. continuing with Computer Science courses, Black EL2 students seemed to perform almost invariably better than Black EL1 students. In the next subsection I explore further the relationship between academic performance and language compared to other factors.

6.2.3 Performance, language and other factors

In this section I discuss the statistical significance of the correlation between academic performance (expressed in pass vs fail and presence in second and third years of study) and a number of factors. I took into consideration indicators commonly used to determine admission to university and particularly to the study of Computer Science, such as Matric aggregate, marks and grade for Mathematics as well as whether a student wrote Computer Studies as a subject. One must bear in mind that particularly the last two depend on the kind of school a student attended, and are therefore indicators of quality of education received as well as academic performance.

Gender did not correlate ($p=0.139$) with passing a Computer Science course, but it did correlate ($p<0.001$) with year of study. This means that, while being male or female did not affect a student's likelihood of passing, it did affect his or her likelihood of continuing with Computer Science courses. Race, on the other hand, correlated with both passing and year of study. This means that being White or Black determined the likelihood of a student both passing a Computer Science course and continuing with second- and third-year courses. Within the sample, race correlated very strongly ($p<0.001$) with gender, suggesting that correlation with one variable might account for correlation with the other. This can be explained by the fact that a lower percentage of Black females compared to Black males took second- and third-year Computer Science courses. This was not the case (at least not to the same extent) for their White counterparts.

Although having written English as a first or second language in Matric correlated significantly ($p<0.001$) with passing a Computer Science course, it did not seem to correlate with continuing ($p=0.452$). This means that a EL1 student was more likely to pass if he or she took a Computer Science course, but this variable alone did not predict his or her likelihood of continuing with

second- and third-year courses. This can be explained by the fact that, as noted above, the majority of EL1 students were native English speakers (with comparatively good academic performance).

Having written Mathematics at the Higher or Standard Grade correlated significantly ($p<0.001$) with both passing and continuing. Having written Mathematics at the Higher or Standard Grade correlated significantly ($p<0.001$) with having written English as a first or as a second language. This makes sense, since they are both indicators of the kind of school a student attended. Possibly for the same reason, having passed Computer Studies in Matric correlated significantly ($p<0.001$) with both passing and continuing. It is not surprising that having received better-quality education would influence one's likelihood of performing better in Computer Science, as in any other subject.

Matric aggregate, marks for Mathematics, Computer Studies, first language and English (as a first or second language), were grouped in two categories: “C and higher” and “D and lower”. They all correlated significantly ($p<0.001$) with passing. This means that, not surprisingly, if a student had high marks in Matric he or she was more likely to pass Computer Science courses. While marks for Mathematics and Computer Studies correlated significantly ($p<0.001$) with continuing into second- and third-year Computer Science courses, this did not seem to be the case with aggregate mark for Matric ($p=0.0016$) and marks for first language ($p=0.109$) and English ($p=0.076$). This means that, while high marks in Mathematics and Computer Studies were good predictors of a student continuing his or her studies into second- and third-year Computer Science, other indicators (including Matric aggregate and marks for the languages) did not seem to be as good. With respect to this, the distinction between speakers of English as a first and as a second language was important.

If only speakers of English as a second language (i.e. Black students) were considered, statistical analysis yielded slightly different results. In terms of passing, correlation was more significant with having written Mathematics at the Higher or Standard grade ($p<0.001$) than with having written English as a first or second language ($p=0.001$). In terms of results, the best predictors of a pass were a C and above as aggregate ($p<0.001$) or for English (either as a first or as a second language, $p<0.001$) and, to a lesser extent, in one's first language ($p=0.003$). A C or above for Mathematics, on the other hand, did not seem to correlate significantly ($p=0.035$) with passing. This means that,

while the use of a C or above in Mathematics Higher Grade as an entry requirement for studying Computer Science seemed reasonable for the sample as a whole, it was not the best predictor of success among Black students; a C as an aggregate or for (any) language was.

Proficiency in English (assessed through Matric results) had a stronger impact on performance in a scientific subject, Computer Science, than Mathematics. Since marks for English as a first and second language were grouped together, a possible objection would be that EL2 students got higher marks for it without necessarily being more proficient in it. The comparatively strong correlation with marks in first language (although partly reflecting marks for English as a first language) would reinforce the link between language proficiency and Computer Science performance. Besides, marks for Higher and Standard Grade Mathematics were also grouped together.

Although a more detailed analysis would be advisable, for the purpose of the present study this grouping of marks for English as a first and second language and of Mathematics at the Higher and Standard Grade seemed reasonable for two reasons. First of all, the percentages of students who wrote English as a second language and Mathematics at the Standard Grade, though comparable in size, were relatively small. This would not have allowed for statistically meaningful application of the chi-square independence test. Secondly, the two variables correlated significantly, meaning that unreliable data in one field would have been matched by a comparable amount of unreliable data (in the same direction) in the other. In other words, if results were skewed by high marks for English as a second language, the same was true for marks for Standard Grade Mathematics.

In summary, gender and race both seemed to affect performance. The strong correlation between the two did not allow me to compare them directly. Quality of previous education influenced performance. For the sample as a whole, aggregate Matric results and marks in Mathematics were the best predictors of success in Computer Science. For Black students, however, results for English were a better predictor than results for Mathematics. Whether or not English was written as a first or second language in Matric was a good predictor of whether a Black student was likely to continue with a second- and third-year course of Computer Science. Table 6 above indicates that, contrary to expectations, the bias might be in favour of EL2 students. This is an interesting result, as it would

entail that students who are perceived to have received a poorer quality of education before to university would be the most likely to graduate in Computer Science.

6.3 Particular groups

In this section I discuss the performance of particular groups of students in order to add further detail to the data presented so far. IsiXhosa speakers and foundation students, being the focus group of my intervention, are discussed. Among foundation students, I pay particular attention to those who continued with more advanced courses in Computer Science after completing Computer Skills. Students who wrote English as a first language in Matric and indicated English as their home language are also considered, mainly for comparative purposes.

6.3.1 isiXhosa-speaking students

Since my intervention focused mostly on isiXhosa, I paid particular attention to students who spoke this language. Xhosa students form the largest ethnic Black community at Rhodes University, and are the only ones to speak their language extensively on campus.

The 246 speakers of isiXhosa were the majority (55%) among Black students in the subsample. Roughly equal numbers of isiXhosa speakers wrote English as a first (129) and as a second (117) language in Matric. Compared to the figures for speakers of African languages as a whole (i.e. two-thirds as opposed to one-third, see Table 7), this means that speakers of isiXhosa were more likely to come from EL2 schools. Among Black students, being an isiXhosa speaker correlated significantly ($p<0.001$) with two indicators of the kind of school a student attended: whether English was written as a first or second language in Matric and whether Mathematics was written at the Higher or Standard Grade.

Table 7: Black students by home language and first language in Matric

	EL1	%	EL2	%	Total	%
English	21	8	2	1	23	5
isiXhosa	129	46	117	68	246	55
Other	128	46	54	31	182	40
Total	**278**	**100**	**173**	**100**	**451**	**100**

IsiXhosa speakers had slightly lower average Matric aggregates (D as opposed to C) compared to speakers of other African languages, but similar average marks for first language, English and Mathematics. One must bear in mind that a higher proportion of speakers of isiXhosa wrote English as a second language and Mathematics at the Standard Grade. This confirms that, in general, isiXhosa speakers were more likely to come from an educationally disadvantaged background. In Computer Science, this might explain the lower average mark (54 as opposed to 57) and pass rate (75% as opposed to 83%) of speakers of isiXhosa compared to speakers of other African languages. As shown in Figure 8, the percentage of isiXhosa speakers in the total number of Black students in various years of study remained the same (roughly 55%) in spite of lower pass rates; this was probably due to a slightly higher number of repeating students.

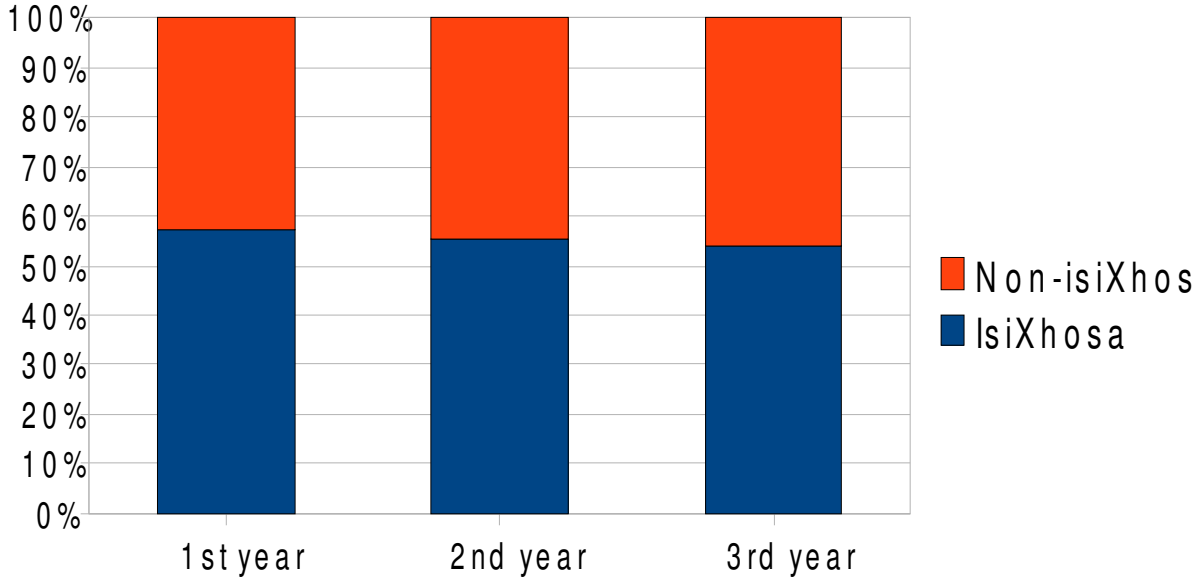


Figure 8: Percentage of isiXhosa speakers in various years of study (n=451)

Data presented in this subsection indicate that isiXhosa speakers were more likely to come from an educationally disadvantaged background compared to other Black students. This affected their performance in Computer Science negatively. Since this is the only Black group to use their language extensively in everyday communication on campus, this might have important implications for language attitudes.

6.3.2 Foundation students

The foundation programme is designed for South African citizens (with rare exceptions) and particularly for members of marginalised communities. It provides alternative access to tertiary education for students who would not normally meet the criteria for acceptance, but have recognised academic potential.

Not surprisingly, Matric results for the 278 foundation students taken into consideration were lower than those for mainstream students. The average Matric aggregate was a D (as opposed to a C for mainstream students), and the average mark for Mathematics was an E (as opposed to a C for

mainstream students). Only 7 students wrote Computer Studies in Matric, mostly at the Standard Grade. Their average mark was an E (as opposed to a B). While the average mark for English was slightly lower than for the mainstream CS students (D as opposed to C), the average mark for first language was the same (B).

The majority of the foundation students (254, or 91%) wrote an African language as their first language in Matric. IsiXhosa speakers were the majority (223, or 80%). Two students also indicated English as their home language, although they both wrote an African language as first language in Matric. There were slightly more male students (147, or 53%) than females. Since the population is too small for a reliable application of the chi-square independence test used above, descriptive statistics are used to understand how these data relate to Matric results and demographic variables (gender and home language).

The pass rate for Commerce and Science students in the foundation computer course was 90%. The average mark was 65, with fluctuations of plus or minus 5 points in recent years. For the 160 students (58%) who wrote Mathematics at the Standard Grade, the average mark was 65, as opposed to 70 for those who wrote Mathematics at the Higher Grade. Having written English as a first or second language, on the other hand, did not seem to make a difference. The average mark for isiXhosa speakers was just slightly lower (64) than that for speakers of other languages (66). This would seem to suggest that having written Mathematics at the Higher Grade was the best predictor of a good mark in Computer Skills, while language did not determine differences in performance.

Only 25 students (9%) who were admitted through the foundation programme continued with a more advanced course in Computer Science. This group is particularly interesting as it allows for comparisons with the figures for mainstream CS students presented above. The majority of them (16, or 64%) were males. While all students but one wrote English as a second language in Matric, 17 wrote Mathematics at the Standard Grade and only 4 at the Higher Grade. Moreover, some students did not write Mathematics at all. According to the available data, none of the foundation students who enrolled for Computer Science mainstream courses had taken Computer Studies in Matric.

In terms of marks in mainstream courses, continuing foundation students competed on an equal footing with other Black students with an average mark of 56 and a pass rate of 78%. With respect to this, one must consider that, especially in CSc101, continuing foundation students had the advantage of having covered the curriculum in their additional year of study. They were present in all years of study and none of them seemed to have repeated courses.

Although the numbers are too small to allow for generalisations, these figures seem to indicate that the foundation year had the effect of "levelling out" the previous educational background of the students, making Matric results for English, Mathematics and Computer Studies less important predictors of progress to and success in later Computer Science courses. Because of their educational and socio-economic background, foundation students were supposedly at the "lower end" of the continuum for Black students. Comparison with students at the opposite end of the continuum, i.e. Black students who attended EL1 schools, and who came from more affluent families and arguably had a better command of English, could be particularly interesting.

6.3.3 Black middle class students

Rhodes University does not keep reliable statistics on the kind of school students attended. The only available indicators of educational background are home language and first language in Matric. Students who claimed English to be their home language and who attended schools where they wrote it as a first language in Matric were likely to be part of the emerging Black middle class. Although it is debatable whether this was actually the case, self-reported home language and, to some extent, choice of school and first language in Matric can be considered reasonable indicators of students' (and their families') language attitudes (see de Klerk 2000).

The 21 students who indicated English as their home language at registration and wrote it as a first language in Matric turned out to be a small proportion (5%) of the 451 Black students who took a Computer Science course between 2001 and 2006. The majority of them (12, or 57%) were females. Students who indicated English as their home language and wrote it as a first language in Matric were comparable to other Black students in terms of average Matric aggregate (D) and

average mark for English/ first language (C). They had slightly higher marks for Mathematics (C as opposed to D), which the majority of them (13, or 62%) wrote at the Higher Grade. Statistics also indicate a higher average mark for Computer Studies (B as opposed to C), although only 3 students wrote it as a subject in Matric. These figures did not clarify whether these students actually came from a better educational background compared to other Black students. Self-reported use of English as a home language and attendance of EL1 schools are therefore used as tentative indicators of both language attitudes and educational background,

In mainstream Computer Science courses, Black students who indicated English as their home language and wrote English as a first language in Matric had slightly higher average marks (59) and pass rate (83%) than other Blacks (55 and 79% respectively). However, contrary to expectations, they were not the ones to score the maximum mark (92), as the highest achievement among them was 86. The most important finding was that the performance of this group of students was comparable to that of other Black students rather than to that of English speakers, who had an average mark of 66, a maximum of 98 and a pass rate of 93%.

Although the small numbers did not allow for statistical analysis, one notices a strong similarity in the number of enrolments for EL1 students who indicated English as their home language and for continuing foundation students in various years of study. The only apparent difference was that, while none of the continuing foundation students repeated courses, some of the mainstream students who indicated English as their home language and wrote it as a first language in Matric did. This would seem to suggest that positive attitudes towards English, as can be inferred from self-reported home language and choice of school/first language in Matric did not predict good performance in Computer Science.

In a further attempt to identify middle-class Black students who attended EL1 schools, those who got an A for English as a first language in Matric were taken into account. The 26 students who matched these criteria (6% of the 451 Black students who took Computer Science courses) were another interesting group for comparison. The majority of them (19, or 73%) were females and 7 (27%) were males. Only 9 (35%) were isiXhosa speakers, while the rest were speakers of other

languages. Two students in this group indicated English as their first language, and were therefore included also in the group discussed above.

The average mark for Black students who got an A for English as a first language in Matric in mainstream Computer Science courses was closer to that of English speakers than that of other speakers of an African language. However, their maximum mark (88) was actually lower than that for all Blacks (92). Pass rates were good (90%) but progression through years of study was not. This means that few students in this group took second- and third-year courses of Computer Science compared to either continuing foundation students or Black students who indicated English as their home language and wrote it as a first language in Matric.

The problem with using an A symbol for English as a first language in Matric as an indicator was that, whether these students were actually members of the emerging Black elite or not, they were definitely high achievers. Therefore it is not surprising that their performance was comparable to that of average English speakers rather than that of other Black students.

Because of the indicators used, findings concerning these two groups of students were not conclusive. However, they would seem to suggest that identification with the English-speaking middle class and high marks in English as a first language do not mean that members of the Black middle class are comparable to English speakers in terms of Computer Science performance. This has important implications as it seems to contradict general attitudes and beliefs, discussed in the next chapter.

6.4 Summary and conclusions

Of the students who enrolled for computer courses between 2001 and 2006, only a small portion has been included in the statistical analysis. The purpose of such analysis was to highlight the impact of language on performance. Therefore South African speakers of an African language were compared with their English-speaking counterparts. Only the mainstream undergraduate courses of Computer Science were considered, to allow for comparison.

White English speakers were overrepresented compared to speakers of an African language, and out-performed them in terms of average marks, pass rates and presence beyond the first years of study. Among Blacks, EL1 students were the majority and appeared to fare better than EL2 students. More detailed analysis, however, revealed that this was true mainly in first year, while in subsequent years Black EL2 students were comparatively more likely to succeed.

Having written Mathematics at the Higher Grade and having written Computer Studies in Matric were predictors of good performance for the sample as a whole. This is not surprising since, together with first language, these are indicators of the kind of school a student attended and presumably of his or her knowledge of Computer Science. When only Black students were considered, marks for English and, to a lesser extent, first language were better predictors of good performance than Mathematics. For Black students of Computer Science language proficiency (as could be inferred from Matric results for English) seemed to be more important than good mathematical skills.

While there seemed to be a clear difference in the performance of White and Black students, the latter group was not completely homogeneous. IsiXhosa speakers were the largest ethnic group. A larger proportion of these students appeared to come from an educationally disadvantaged background compared to speakers of other African languages. This seems to be a better explanation for their comparatively poor performance in Computer Science compared to other Blacks than the possibility that they spoke their language more often on campus, and may therefore have been exposed to less English.

Foundation students who continued with mainstream Computer Science courses had similar marks, passing and continuing rates to those of other Blacks. One must consider that, especially in first year, these students had the advantage of having covered part of the curriculum already and having been at university for one year more than their mainstream counterparts.

Students who indicated English as their home language and wrote it as a first language in Matric did not seem to perform any better than other Black students, and were not comparable to English speakers. Whether indicating English as home language and/or attending EL1 schools were

considered indicators of positive attitudes towards English or better educational and socio-economic background, they did not seem to correlate with better performance. High achievers in English as a first language among Black students had comparable (but not equal) performance to White students. It is debatable whether this reflected better English proficiency, educational background or general academic skills.

CHAPTER 7: LANGUAGE PRACTICE, PROBLEMS AND ATTITUDES

In this chapter I discuss a preliminary investigation which involved classroom observation and interviews as well as the findings of questionnaires on language attitudes. Data presented in this chapter informed my practical intervention, described in the next chapter. The attitudes of different groups of students are analysed to further the discussion on linguistic hegemony.

7.1 Language practice and problems in the classroom

My preliminary investigation took place mainly in 2004, and included classroom observation and exploratory interviews. Its purpose was to get a better understanding of the issues (particularly language-related) that students face in Computer Science, and to make initial contact with the target group for my intervention.

7.1.1 Classroom observation

In this subsection I describe some observations I made in classes where Black students learnt about computers. Although some of the findings presented here also apply to the first-year mainstream Computer Science course (which I attended as a student), I focused mainly on the foundation students.

During the course of 2004 I conducted classroom observation of foundation students in their computer course by attending lectures and practicals. I observed that whenever possible, interaction among students and with tutors seemed to take place in a common African language, while English technical terminology was used. For most students, especially those who were not confident with their English, other students were the first port of call. When students and tutors did not share the

same language, it was not uncommon for a student to listen to an explanation in English from a tutor, and then explain to a fellow student in a common African language, in most cases isiXhosa.

As part of my intervention I contributed to organising and structuring this process. Instead of relying on *ad hoc* explanations by tutors or fellow students, I felt that explanations in the students' mother tongue needed to be developed, verified and made available to all students simultaneously. Making explanations available in a simple and accessible form to all students simultaneously was one of the main reasons for developing a glossary as an integral part of my study. Tutors supported both lectures and tutorials by assisting students. This often entailed running around the classroom and, in most cases, explaining the same thing many times to different students. This showed the need for a repository where the most common problems encountered by students could be addressed.

The course required students to become familiar with computer-related academic discourse and master a whole set of new terms which they had never encountered before. During lectures and tutorials, I sat in class noting some of these terms for later inclusion in the glossary which formed an integral part of my study. Most words were either technical computer terms (e.g. “CPU”, “flashdisk”, etc.) or words which acquired a technical meaning in the computer domain (e.g. “file”, “folder”, “edit”, etc.). I also took note of difficult English words which were used during the explanations (e.g. “metaphor”) and which, in my opinion, students were unlikely to be familiar with. For my intervention, I took the students' handbook as the starting point, compiling a list of all computer terms for which definitions were provided.

In 2004 I enrolled for the first-year mainstream Computer Science course. In spite of a faster pace and more emphasis on theoretical issues, the content covered in the course was similar to that of the foundation computer course. In particular, I noticed striking similarities in the linguistic behaviour of speakers of an African language in both courses. This was later confirmed by interviews with students and tutors. This is an important point, since much of the stigma attached to foundation programmes is linked to perceived low English proficiency. In turn, English proficiency is commonly associated with extensive use of African languages.

7.1.2 Problems and attitudes in learning CS terminology through an African language

In 2004 and 2005 I conducted exploratory interviews with 17 students and 8 tutors, both in the foundation and mainstream computer courses. As discussed in subsection 5.3.2, the main purpose of these interviews was to highlight broad issues and general trends, and to help me shape the direction of my intervention. The purpose of this subsection is not to provide evidence to substantiate any particular claim, but to introduce the reader to key issues and broad trends which will be developed further during the discussion of the questionnaire data in section 7.2, and of the shaping of my intervention in Chapter 8.

A few foundation students were resentful for not having been admitted to mainstream courses (e.g. “foundation is a waste of time and money”). This was seen as a form of discrimination, to separate them from “normal” (i.e. mainstream) students on the basis of their educational and social background. English proficiency played a major role in deciding which students were assigned to the programme (e.g. “we should be put in the normal courses, so we can learn to speak English like the others”).

Learning technical terminology in English emerged as a major problem (e.g. “English computer words are difficult”). The idea of developing new terminology in the African languages was generally considered amusing if not impracticable. In spite of these negative attitudes, I felt that making equivalents of the English technical terms in their mother tongue available to students could help them. My assumption was that even if such terms were not used, they would serve as stepping stones towards a better understanding of the English terms. Most importantly, this would convince students of the potential of their language to be developed. The foundation students who agreed to be interviewed were generally favourable to the idea of developing material in their mother tongue, and eager to get involved. However, comparatively few indicated they would use such material themselves (e.g. “this would be a good idea for the others, but I grew up in Pretoria, and I speak tsotsitaal”).

Making it possible to use a glossary explaining the terms in their mother tongue was viewed favourably by students. Quite a few of them were sceptical about the possibility of using on-line

resources, and claimed that paper-based material would be more accessible, particularly for those who were not familiar with computers. The written standard of African languages seemed to be more of a problem for students from township schools rather than for those from rural schools (a student from a rural area said "Where I come from we speak the real Xhosa, so I can even read books in Xhosa"). In both cases, students reported relying more on oral explanations in class than on written material, Interaction with the students convinced me that on-line materials needed to be supplemented by a print version. While electronic resources allowed for the use of multimedia, the use of written material seemed acceptable provided that the language used was simple and close to the variety actually spoken by the students.

Mainstream students who were also speakers of an African language seemed to be enthusiastic about the idea of a more extensive use of resources in their mother tongue at university. However, few of them felt they needed such resources (e.g. "I went to English schools and we speak English at home. Using Zulu at varsity would be confusing for me"). This suggests that while these students had a positive integrative orientation towards their mother tongue, they saw little instrumental value in using it themselves. These students expressed similar attitudes to those of speakers of other languages, including English. Mainstream students who did not speak an African language supported the idea of providing Black students with additional material in their mother tongue. Both groups seemed to believe that intervention was more appropriate for students in the foundation programme.

Interviews with tutors of both the foundation and the mainstream courses yielded interesting results. Tutors in both courses generally acknowledged the existence of language problems among Black students. Reported patterns of behaviour, including the extensive use of African languages in practicals to communicate with other students and tutors, were similar in both groups. Black students in the mainstream course reportedly encountered similar problems and showed similar linguistic behaviours as foundation students. While most tutors spoke English as their mother tongue, one of them was an isiXhosa speaker. It is worth noting that this particular tutor opposed the use of African languages, claiming that "this would make students lazy, and they will not learn English". Responses to the questionnaire surveys confirmed that the latter was a common argument against the use of African languages in the academic context.

7.2 Questionnaires

As part of my study, I ran three questionnaire surveys. The first one was run in 2004 (see Appendix A) and targeted South African speakers of an African language. The other two were run in 2005, one for South African speakers of an African language (2005a – see Appendix B), and another for all other students (2005b – see Appendix C). In this section I discuss the different attitudes of EL1 and EL2 students and how these reflect hegemonic relationships. I then highlight students' attitudes which informed my intervention, discussed in the next chapter.

7.2.1 The three questionnaires

In this subsection I discuss the differences between the three questionnaires I used in my survey. These served different purposes and had a different focus according to the phase of my research during which they took place. In spite of this, many questions remained the same. Whenever possible, answers to the different questionnaires were compared or combined.

The purpose of the 2004 questionnaire was mainly to assess the language attitudes of students who could benefit from a bilingual intervention. It targeted speakers of an African language among foundation students as well as mainstream first-year students of Computer Science. It was administered in class during practicals, after a brief oral explanation of the topic of my research. This means that students were aware of the scope and boundaries of my research. In particular, I made it clear that I was exploring the possibility of using African languages *alongside* (and not *instead of*) English. The questionnaire had 59 respondents. This represented a response rate of approximately 52%, the highest among the three questionnaires.

Data analysis of the 2004 questionnaire suggested changes in the number, order and selection of questions in the 2005a and 2005b questionnaires. In the discussion below, figures for the responses to similar questions for particular groups of students have been grouped together. The main purpose of the 2005a and 2005b questionnaires was to highlight differences in language attitudes between different groups of students. As shown in the discussion below, such comparisons are important in deconstructing hegemonic relationships.

The 2005a questionnaire targeted South African speakers of an African language who had taken a Computer Science course at any stage in their career. The questionnaire was completed by 105 students (i.e. 38% of the population). The response rate was comparatively lower than that for the 2004 questionnaire since students were invited to compile the questionnaire on-line via e-mail. This also meant fewer of them knew about the topic and purpose of my research, since I did not have the chance to explain it to them directly.

The 2005b questionnaire was administered to all students of computer courses not included in the previous questionnaire, i.e. mainly English speakers or non-South African speakers of an African language. It was filled in by 163 students (i.e. 23% of the population). This was the lowest response rate among all questionnaires. Apart from the methods of administration, similar to the 2005a questionnaire, a possible explanation could be that students in this sample felt less emotionally involved with the topic of the research.

The language profiles of respondents to the 2004 and the 2005a questionnaires were similar. IsiXhosa speakers were the majority in both cases (54% and 64% respectively), followed by speakers of isiZulu, Sesotho and Setswana (approximately 10% each), and other African languages (between 2% and 5% each). English was indicated as a mother tongue by 10% of the respondents, usually together with an African language.

While the sample for the 2005b questionnaire was by no means homogeneous, almost all respondents used mainly English on campus. Apart from speakers of an African language which was also spoken in South Africa, who were a small minority, the possibility of using material in an African language did not affect these respondents directly. Respondents were mainly speakers of English (65%). Speakers of Afrikaans and of African languages also spoken in South Africa (e.g. isiNdebele speakers from Zimbabwe) both accounted for 5%. Speakers of other African languages (e.g. Chishona) accounted for 15%, and speakers of other languages (both Asian and European) for the remaining 10%.

Home language was linked to previous experience with computers. As shown in Table 8, only 8% of the respondents to the 2005b questionnaire claimed to have little or no experience with

computers when they came to university, as opposed to 46% of respondents to the 2005a questionnaire. The figures were even higher for foundation students and for EL2 students (51% and 68% respectively).

Table 8: What experience did you have with computers before coming to University?

	2005a	**2005b**
Little or no experience	*46%*	*8%*
Basic literacy	*42%*	*54%*
Fully literate	*12%*	*38%*

In spite of different levels of self-assessed computer literacy at enrolment, the percentages of students who claimed they wanted to continue with Computer Science were similar for speakers of an African language and of (mainly) English, i.e. roughly equal proportions of "yes", "no" and "not sure". However, as shown in the previous chapter, for speakers of an African language this was far less likely to happen.

7.2.2 Attitudes and hegemony

In this subsection I compare the attitudes of EL1 (Black and White) and EL2 students. These indicate a positive orientation towards English as well as towards the possibility of a bilingual (English/African language) intervention. These reflect the contrasting ideologies discussed in Chapters 2 and 3. Evidence presented in this subsection suggests that students who would possibly benefit the most from a bilingual intervention appeared to resist the use of African languages in tertiary education, possibly for fear that this would entail lower levels of English proficiency (see Dalvit et al. in press).

Table 9 shows the percentages of respondents to the 2004 and 2005a questionnaires who attended EL1 and EL2 schools. Only 5% of the respondents to the 2005a questionnaire attended EL2 schools, but indicated having written English as a first language. They show the strong link

between type of school attended and first language in Matric, discussed in the previous chapter. For the purpose of my study, I assumed that respondents to the 2005b questionnaire who indicated English as their mother tongue attended EL1 schools and wrote English as a first language.

Table 9: Which kind of school did you go to?

	2004	**2005a**
EL1	**48%**	**38% (43%)***
EL2	**52%**	**62% (57%)***

* Figures in brackets represent students who wrote English as a first (EL1) or as a second (EL2) language in Matric.

Respondents to the 2004 and 2005a questionnaires reported feeling proficient in their mother tongue. Consistent with previous research (see Dalvit 2004), this was more so for oral (59% strongly agree and 33% agree) than for written (43% strongly agree and an equal proportion agree) proficiency. EL2 students consistently reported better self-assessed proficiency in their mother tongue.

The belief that African languages should receive more support from the government varied between the 2004 and the 2005a/2005b questionnaires, from 77% to 34% and 22% respectively. This might reflect the fact that respondents to the 2004 questionnaire received a brief explanation from me, providing a concrete example of support for African languages they could relate to. Black EL2 students were the most supportive in the 2004 questionnaire (90%) and the least supportive in the 2005a one (15%). This could be attributed to the fact that a brief description of the project might have eased some of the fears Black EL2 students had about using their language.

Students had generally positive attitudes towards English and its use in education. Approximately 65% of the respondents to the 2004 questionnaire thought that the earlier a child started using *only* English to learn in school, the better. This belief was particularly strong among Black EL2 students in the 2004 questionnaire (78%). Respondents to this questionnaire were in their first year, when the better quality of their prior education advantages Black EL1 students

The belief that studying in English improved proficiency in the language was supported by 83% of the respondents to the 2004 questionnaire and 92% in the 2005a one. The difference is due mainly to the inclusion of students in years of study beyond the first in the 2005a questionnaire, who were more supportive of this belief. Self-assessed proficiency in English was higher among EL1 (more than 70% strongly agreed they were proficient) than EL2 (approximately 20%) respondents to the 2004 questionnaire (93%). A drop in the 2005a one (13%) could be explained by the different wording of the question

In the 2005b sample, the percentages of those who claimed that their English was good enough to follow Computer Science lectures and read Computer Science manuals (14% and 10% respectively) were not dramatically different to the ones for respondents to the 2005a questionnaire, who were mostly speakers of English as a second language. Surprisingly, figures were even lower if only English speakers were taken into account (9% and 8%). Although these data are puzzling, they could be attributed to the difficulty of the technical language used in Computer Science. This would also explain the similarity between responses to the two questionnaires, since Computer Science English could be equally daunting for both first- and second-language speakers.

Table 10 shows that for EL1 students (both Black and White) the main problem in Computer Science was to understand what they were supposed to do. For EL2 students, however, understanding technical terms and explanations was a greater challenge. Fewer of them felt that Computer Science was not problematic at all. This is consistent with lower self-assessed proficiency in English, and could contribute to explaining the comparatively low performance of this group, especially in first year. Consistent with the discussion in Chapter 4, these findings indicate that intervention at the lexico-grammatical level would benefit EL2 students.

Table 10: Main problem with CS

	EL2	EL1 (Black)	EL1 (White)
Explanations	**23%**	**6%**	**9%**
Terminology	**31%**	**9%**	**14%**
Instructions	**35%**	**50%**	**40%**
No problem	**12%**	**35%**	**37%**

More than 70% of the respondents claimed they understood and remembered things equally well in English and their mother tongue. However, approximately 45% of the sample thought that studying some things in their mother tongue would prevent them from learning enough English. Only 28% believed that, if they learnt something in their mother tongue, they would not be able to explain it in English. The difference between the last two figures seems to indicate that students were concerned about using their mother tongue *instead* of English, but agreed that whatever they learnt in their mother tongue they could translate into English. In both cases, support was stronger among EL2 students. This reflects greater emphasis on gaining English proficiency. As shown in the previous chapter, low English proficiency determined the comparatively poor performance of speakers of an African language in Computer Science.

As shown in Table 11, beliefs on the best way to assist students who experienced language problems were similar in all three questionnaires. A more detailed analysis of the data reveals that EL1 students (both in the 2005a and the 2005b questionnaires) were far more favourable to the use of material in the African languages than EL2 students (28% as opposed to 4%). This seems to confirm once again that students who were more likely to need material in their mother tongue were less likely to support its use instead of English.

Table 11: The best way to help students who are struggling because of language problems is:

	2004	2005a	2005b
More English teaching	**44%**	**46%**	**37%**
English and mother tongue	**49%**	**40%**	**41%**
Support material in an African language	**17%**	**14%**	**22%**

Data presented in this subsection indicates that Black EL2 students, though feeling more proficient than Black EL1 ones in their mother tongue, resisted its use as LoLT. This seems to be based on lack of confidence in English and a fear of not achieving sufficient proficiency in it. Having written English as a first or second language in Matric did not seem to affect support for a bilingual intervention. In the next subsection, I discuss data from the questionnaires which contributed to shaping such an intervention.

7.2.3 Attitudes informing my intervention

In this subsection I draw on data from the language attitudes survey to discuss the focus of my intervention in terms of scope (additional teaching material), format (a glossary), expected outcomes (attitude shift), and possible challenges (lack of terminology in African languages and possible interlinguistic tensions). The survey also gauged students' willingness to get involved in the promotion of their language. As shown in the next chapter, this was important for my intervention.

Rather than offering two separate courses (one in English and one in an African language), students favoured the development and use of additional teaching material in African languages (54% and 58% respectively). Support among foundation students was stronger in the 2004 questionnaire (70%), when it had been explained in class that this would not replace the current existing material in English. In the 2005a questionnaire, a comparatively low percentage of

foundation students and isiXhosa speakers (both at 47%) thought that using material in their mother tongue was a good idea. However, the overall support by first-year students was quite impressive (72%).

As shown in Table 12 , the preferred format for possible bilingual support material seemed to be a glossary of English computer terms explained in the students' mother tongue, and on-line solutions using African languages, both supported by 39% of the 2004 respondents. Preference for a glossary was confirmed by 44% of the respondents to the 2005a questionnaire, followed by audio-recorded explanations (36%). Although only 15% of the students had ever seen open-source software in their mother tongue, 30% thought it would constitute a viable support material. In both questionnaires, translations of manuals and handouts were chosen by a minority (18% and 26% respectively). The consistency between the 2004 and the 2005 questionnaires supported the choice of a glossary for my intervention.

Table 12: If the university decided to produce support material in your mother tongue, which of the following kinds of material would you find useful?

	2004	**2005a**
Glossary	**39%**	**44%**
Audio explanations	**21%**	**36%**
Localised software	**26%**	**30%**
Manual/handouts	**28%**	**18%**
On-line solutions	**39%**	**--**
None	**30%**	**30%**

More respondents to the 2004 questionnaire believed that using material in their mother tongue would help their understanding (46%) than would boost their confidence (32%) or improve their marks (30%). This reflected the assumption that assessment would still take place in English.

Consistent with these attitudes and with the discussion above, an improvement in attitudes towards African languages seemed a more reasonable outcome of my intervention than an improvement in marks. Only 25% thought that material in their mother tongue would not help them and 23% said it would confuse them.

Comparing the 2005a with the 2004 questionnaire, the figures concerning the positive aspects of using bilingual material were approximately ten percentage points lower and figures concerning negative aspects were ten points higher. Almost half of the students (41%) felt it would be too late for them to start using material in their mother tongue, and that they would have needed it earlier. The low percentage of respondents who believed that students would not use such material in both questionnaires (16% and 27% respectively) strengthened my resolution to develop it as part of my intervention.

According to respondents to the 2005a questionnaire, the main obstacles to using material in the students' mother tongue seemed to be the lack of terminology, and the fact that using such material would upset speakers of other African languages (both acknowledged by 66%). Just more than half (55%) were concerned about the costs involved, and 45% about the fact that they would not learn enough English, and that manuals in their mother tongue would be too difficult. Consistent with the discussion in the previous subsection, Black EL2 students were more concerned about not gaining English proficiency, and less concerned about the difficulty of material in their mother tongue than Black EL1 students. The lack of lecturers who could teach Computer Science in their mother tongue concerned 36% of the students, and only 7% could foresee no problem at all.

In terms of the best strategy to develop African languages, 31% of the respondents to the 2004 questionnaire thought that it would be impossible to talk about computers in their mother tongue, 40% suggested that new technical terms in their language should be developed, and a further 22% suggested that English borrowings could be used. Only 7% thought that their mother tongue could be used as it is to talk about computers. These figures are not conclusive, and the most appropriate strategy for term creation would inevitably depend on the particular term. However, they point towards a more “purist” attitude, noted in the discussion on language attitudes in Chapter 3.

Since Rhodes is located in an isiXhosa-speaking area, development of material would concern particularly this language. The concern that using material in an African language would create tensions with speakers of other languages was particularly strong among isiXhosa speakers (77% as opposed to a 66% figure for the whole sample). This is consistent with generally negative attitudes towards the use of African languages among students who would be the prime target of a bilingual intervention. Speakers of African languages other than isiXhosa, which were unlikely to receive attention, did not seem to voice a strong concern. At least in the initial phase, however, I structured my intervention so that speakers of all languages could contribute to the development of bilingual material on a voluntary basis.

In spite of comparatively negative beliefs about the effects of using additional material in the African languages, 31 (approximately one-third) of the respondents to the 2005a questionnaire volunteered to help in the process of developing such resources. Of these, 23 were foundation students. This contributed to my decision to focus on foundation students for my intervention, discussed in the next chapter.

7.3 Summary and conclusions

Preliminary investigation suggested that language was an important issue in learning about computers, and that African languages were used whenever possible in interactions among students and between students and tutors. This confirms common practice at lower levels of education and in other subjects. Code-switching in practicals seemed to take place both in foundation and mainstream courses. I felt that intervention was needed to standardise the process, ensuring that explanations in the African languages are of good quality and are made available to all students who need them.

Particularly in their first year, Black EL2 students seemed more likely to benefit from an intervention unpacking English technical terms than their Black EL1 counterparts. Having attended EL2 schools, the former were more confident about using their mother tongue and supportive of its development. However, they were the least supportive of a bilingual intervention, possibly for fear that this would entail lower levels of English proficiency. This could be seen as a reflection of

linguistic hegemony, and highlighted the need to clarify that African languages would not substitute English as LoLT.

Students supported the development of a glossary of English technical terms explained in the African languages as a suitable format for additional material. Respondents seemed to believe that using such material would improve understanding rather than marks, since assessment is in English. The main challenges seemed to be the lack of terminology in African languages, and the fear that giving prominence to one African language over the others could create tensions. In terms of development of new terminology, students expressed a “purist” orientation, possibly as a legacy of apartheid's language policies.

The fear of possible interlinguistic tensions was stronger among speakers of isiXhosa, the language most likely to take prominence. This was consistent with a general tendency for students who were most likely to be the target of an intervention to support it the least. In my intervention I allowed for speakers of all languages to participate. Students in the foundation course indicated a strong willingness to contribute to the development of their mother tongue. The nature and outcomes of this involvement are discussed in the next chapter.

CHAPTER 8: INTERVENTION

In this chapter I describe the three phases of the development and implementation of resources in English and African languages (mainly isiXhosa), which form an integral part of this study (Dalvit et al. 2007a). I discuss its various phases with a particular emphasis on how reflections and lessons learnt at each stage informed the following one. I conclude with an evaluation based on a questionnaire survey.

8.1 Phase 1: initial steps

The first phase of my intervention took place in 2004 and 2005. Concurrent with the statistical analysis and language attitudes survey described in the previous chapters, during these two years I conceptualised the problems and the options for intervention (Dalvit et al. 2004a; Dalvit et al. 2005b; Dalvit et al. 2006b). Key features of both the content and the tools to be used were outlined and tested with students.

8.1.1 Volunteer students

In this subsection I describe the aspects related to content development in the first phase. I start by motivating my methodological choices (i.e. reliance on volunteer students) in the light of some of the problems commonly associated with the use of African languages (see Dalvit et al. 2005a). I then describe my actual experience in working with the students, integrated with reflections which informed the following phases. My assumption was that students would be happy to participate. I expected to encounter problems, mainly related to students' low written proficiency in African languages.

In the initial stages of my intervention, I experimented with getting students to develop their own material on a voluntary basis (see Ramani and Joseph 2006). Students were selected mainly from the foundation programme through contact in class, during the preliminary interviews and through

the questionnaires. They were encouraged to meet with fellow native speakers of their language in their own time, and help to translate and develop material to teach computer literacy in their mother tongue. My envisaged role was to provide the venue, the equipment (e.g. computers to work on), technical and general language expertise and refreshments to turn the experience into a social event. I hoped that reliance on volunteers would enable me to tackle some of the issues commonly associated with the use of African languages, i.e. their supposed underdevelopment, issues of costs and possible tensions arising from giving prominence to one African language over others.

As noted in Chapter 2, African languages have many different regional varieties, and many of their speakers are not necessarily proficient in the "standard" variety, either in its written or its oral form. During the sessions, students were encouraged to use a variety as close as possible to the one they spoke. Although they were encouraged to create new indigenous terminology, code-switching was allowed. I hoped that, given a sufficient number of volunteers, this would ensure that a wide range of varieties would be represented, and that the language used would be a reasonable compromise that everybody could understand. This was based on reflections on observation in the classroom, where speakers of different varieties of the same African language discussed orally about computers, often relying on code-switching and on the use of English borrowings.

Reliance on volunteers was intended to address the issue of costs of professional translation. The issue of costs features prominently in academic and public discussion (Titlestad 1996; Mgqwashu 2007), although it did not emerge as strongly in either the interviews or the questionnaires. However, working within the budget was a concern for a small research project in its initial stages, such as the one described here. This is particularly important if one considers that, in order to avoid tensions, material would have to be translated into all African languages at the same time, multiplying the costs by nine.

Attitude surveys discussed in Chapter 3 and confirmed by my own findings in Chapter 7 suggest that giving prominence to one African language and not the others might lead to tensions in multilingual classrooms. In the initial stages of my intervention I therefore allowed for the use of all languages represented in the classroom. Since Rhodes University is situated in a predominantly isiXhosa-speaking area, I anticipated that isiXhosa would take prominence, supported by a

relatively larger language community and readily available resources compared to other languages. However, if other students felt that their language was not given enough prominence, they could volunteer and assist in developing it.

Activating students and getting them to take responsibility for the development of their own language was an important point in terms of the "bottom-up" language development advocated by government bodies (LANGTAG 1996). Within the framework of action research methodology, this contributed to the proactive character of the intervention. Besides the actual production of the material, getting students to actively engage with the concepts and to work on their explanation in their mother tongue was probably the most valuable component of my intervention in these initial stages. I also hoped this would spark a sense of ownership of the project among students, and increase their confidence as knowledgeable people both in the field of computing and in their mother tongue. Ultimately, I hoped this would make students realise the role they could play as organic intellectuals, i.e. people from a marginalised background who were in the process of acquiring the tools to spearhead social change.

Activating local users and linking the teaching of computers with the local context and metaphors are the tenets of Ethnocomputing which, as mentioned in Chapter 4, informed the shaping of my research. Reliance on volunteers, however, was inspired by the open-source movement with which I became familiar concurrent with the initial stages of my intervention. I imagined that, as software developers around the world contributed to the development of freely available alternatives to proprietary software, students from a marginalised background could contribute to the development of material in their mother tongue. The obvious differences were the scale of the projects and, of course, the level of expertise of the participants.

Almost from the outset isiXhosa speakers took prominence in the intervention and soon became the only group involved. This did not seem to upset speakers of other languages, since involvement in my project was seen as an additional activity isiXhosa speakers pursued in their own time. A group of five isiXhosa-speaking students seemed to be committed to the project, and I involved them in various workshops. These took place mainly during weekends throughout 2005, compatibly with the students' study commitments. They translated parts of the course handbook. Step-by-step

instructions, which constitute a large portion of the handbook, presented little challenge and there was an immediate agreement on key terms such as "click", which was translated as "*cofa"*. When asked to work on a list of terms in order to compile an initial glossary, most of the work consisted of literal translation with little explanatory potential. For instance, the word "arrow" (referring to the mouse pointer) was translated into "*umkhonto"* (i.e. "spear") which, though part of the traditional African context most students are familiar with, does not really add to its explanation and to its meaning in the computer domain.

As was to be expected, a still superficial understanding of how computers work prevented these students from moving beyond the translation of instructions. Although I made myself available to explain what various concepts meant, I believe these could not be immediately appropriated by the students in order to improve the translations. The students lack of training in linguistics made it difficult for them to create original and clear explanations of the concepts they encountered.

Possibly because of the small size and relative homogeneity of the group, there seemed to be agreement on the regional variety to use. With respect to this, I had to rely mainly on what students told me directly, since my proficiency in isiXhosa was still too low at that time to follow conversations. All students in this group had written English as a second language in Matric. A possible explanation for this is that students who had written English as a first language did not feel confident enough in using the written form of their mother tongue to volunteer. It is important to note that, as shown in the previous chapter, these students were the most favourable to the promotion of their language in principle.

Many Black students are not familiar with the written variety of their mother tongue (see Heugh 2000). In order to tackle the issue of the difference between various spoken varieties and the written standard by exploiting the full potential of the new technologies, volunteers were asked to create video tutorials integrated by audio explanations. This allowed them to talk about computers using their mother tongue. This proved to be a particularly interesting activity, and, despite minor technical problems, quite productive. Integration of multimedia is an example of how ICT can address some of the problems traditionally associated with the use of African languages, i.e. low written proficiency among their speakers. Although it was implemented only in the final stages, and

never tested in the classroom, this was a constant feature of the design of the applications I used for my intervention.

8.1.2 An ad hoc application

The application I used in my intervention had to have specific features. First of all, it had to allow for the integration of multimedia. The use of images, audio and video explanations together with text addressed the problem of low proficiency in the written variety of African languages among their speakers. Secondly, it had to be Web-based, to allow students to work collaboratively and access the application from any machine on campus. Thirdly, it had to be instrumented to inform research, i.e. collect data about its usage and allow for feedback. Finally, it had to be developed using open-source tools. From the practical point of view, this saved the costs of using proprietary software, and ensured that the application could be freely distributed once developed. From the ideological point of view, the open-source community subscribes to the values of collaboration and sharing which informed my intervention (see Dalvit et al. 2008b).

A proof-of-concept application was ready by September 2004 (Dalvit et al. 2004b). It had three main components: a glossary, a chat room and a knowledge base. The glossary was the core component of the system. It allowed students to search a term in any language. It recorded terms students looked for in order to inform research and future development. Although the glossary was mainly text-based, it allowed for the linking of images, audio and video files which could be streamed over the network. The chat room allowed for real-time interaction in the classroom. This enabled tutors to save time by assisting several students simultaneously. It also allowed students who completed their tasks to help others, without moving around the classroom. Perhaps most importantly, students were allowed to use any language. The envisaged use of the chat room was based on the existing practice, confirmed by classroom observation. The records were stored and could be later analysed for research purposes. The knowledge base allowed for asynchronous communication between students and tutors/lecturers. Students could ask questions and the answers would become part of a database available to all other students. In 2004, the lecturer for CS1S was an isiXhosa speaker, and although it never actually happened, this made it theoretically possible to have written interaction in isiXhosa between herself and the students.

This initial application had several limitations and was never actually used in the classroom. First of all, although it had most of the necessary functionality, it was not an integrated system. Different features formed part of different applications and were not part of a consistent user interface. The glossary did not allow for easy switching between languages, which made it virtually impossible to use. The use of real-time communication in the public computer laboratories is heavily restricted by Rhodes' IT division to limit bandwidth use. Moreover, lecturers discourage the use of such tools during lectures, for obvious reasons of class management. As a result, even though it featured in all versions of the application, the chat room component could never be used. The knowledge base feature, though viable from a technical point of view, was not implemented because there was no clear commitment from the lecturer or tutors to answer students' questions. Overall, the application was ready late in the year when students were beginning to prepare for exams, and there was little time for experimentation with new tools.

The constraints mentioned above prompted the development of an *ad hoc* application (Dalvit et al. 2005c). Tools freely available on the Web were taken as a starting point and customised. The result was a new system running from a server in my office. Students could access it from any computer on the Rhodes network, although for security reasons it was not accessible from outside Rhodes. The URL students had to enter was linked to my machine (i.e. “g01d0010.ict.ru.ac.za”). This made it difficult to remember, but gave me and the developer (a PhD student in Computer Science) complete control over the server.

The whole system was now integrated and all the envisaged functionalities were there (Dalvit et al. 2005b). In the glossary, students could easily switch between languages through a drop-down box. The chat room worked properly and allowed for direct copying and pasting of images, such as screen shots, etc., which could integrate explanations. The knowledge base was indexed by topic and allowed students to submit questions by email. All interactions between the students and the system were recorded in a MySQL database. The interface (see Figure 9) was Java-based. This means it could be easily modified by an expert programmer, and it could be redistributed without cost and with no restrictions. Most computers in the public computer laboratories had the necessary plug-ins (Java Runtime Environment 4), and the application would work from any Web browser.

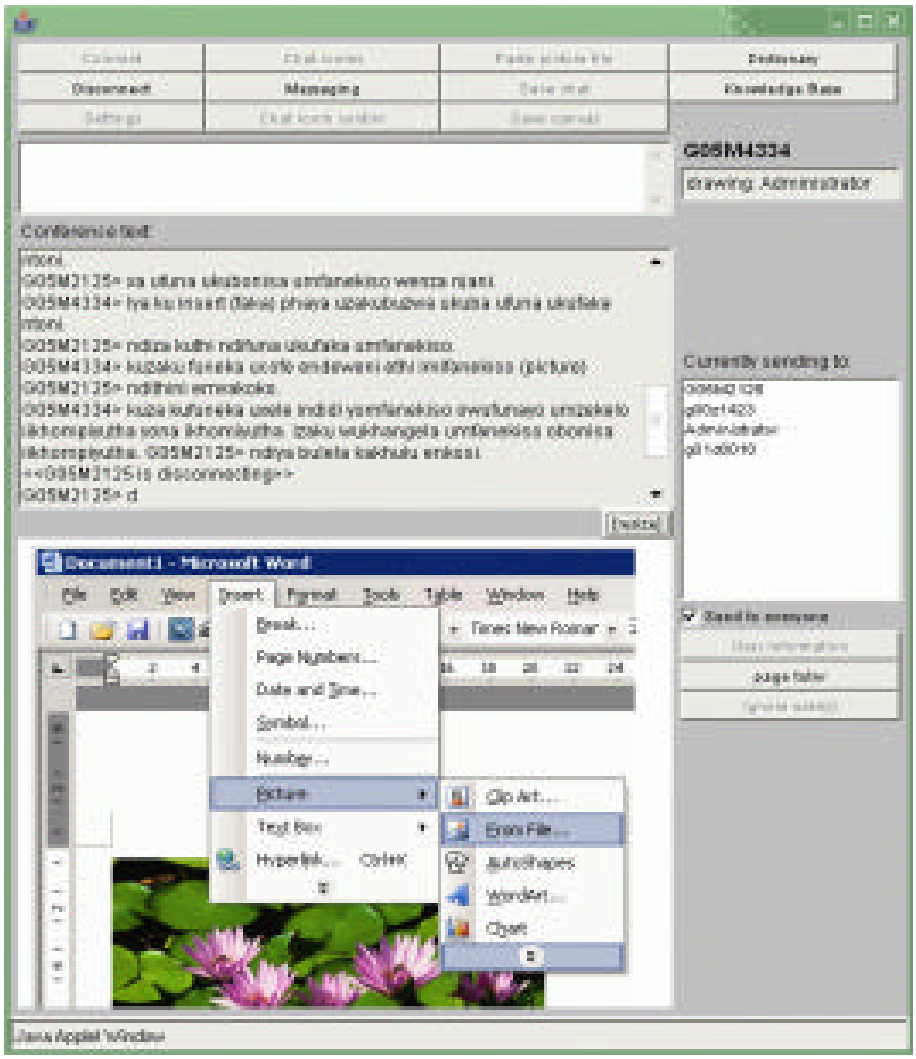


Figure 9: *Ad hoc* application

However, the application was rather resource-intensive. This made it slow and, in the case of a lab with 20 or more students connected, almost unusable. Moreover, the application was "foreign" to all other class activities, and became an additional tool that students were not actively encouraged to use. This problem was addressed by the use of Moodle in subsequent years. The *ad hoc* application was used only for testing by the group of five volunteers mentioned above. In spite of positive feedback about the general idea, its practical implementation was problematic.

8.2 Phase 2: consolidation

2006 was a year of consolidation and reflection on the initial experiences. Although the basic ideas remained the same, I changed both the way I approached the development of content and the tools I used to deliver it.

8.2.1 Extending involvement

Results from the first phase indicated that by relying on volunteers I would achieve neither the volume nor the quality of material that could actually have a meaningful impact. In the second phase of my intervention I extended the group of people participating to the development of the material in two directions.

In the first instance, I tried to involve the whole CS1S class. Students could collaborate on-line on the translation of their handbook and on the compilation of a glossary. While expecting more active and fruitful participation among isiXhosa speakers, I still left the opportunity open to speakers of all languages. Students seemed to be enthusiastic about the idea of getting involved. This applied also to students from smaller language groups, such as siSwati, for instance. However, during my interventions in class I met considerable resistance from Black students who claimed not to be familiar with the written variety of their mother tongue. A few individuals made considerable efforts, but the results remained necessarily haphazard, with patches of translated material in different sections. Problems encountered in the first phase, i.e. superficial knowledge about computers and lack of linguistic training, were confirmed in this phase as well. The haphazardness of contributions did not allow for systematic follow-up to assess the participants' perceptions and reflections on their experience.

The second dimension for expansion has been getting Honours students at the University of Fort Hare involved. This was made possible by the long-standing collaboration between the Telkom Centre of Excellence of Rhodes University, which partly sponsored my research, and its counterpart at the University of Fort Hare. As part of their research, two Honours students worked on two components of the intervention: translation of the material and development of multimedia

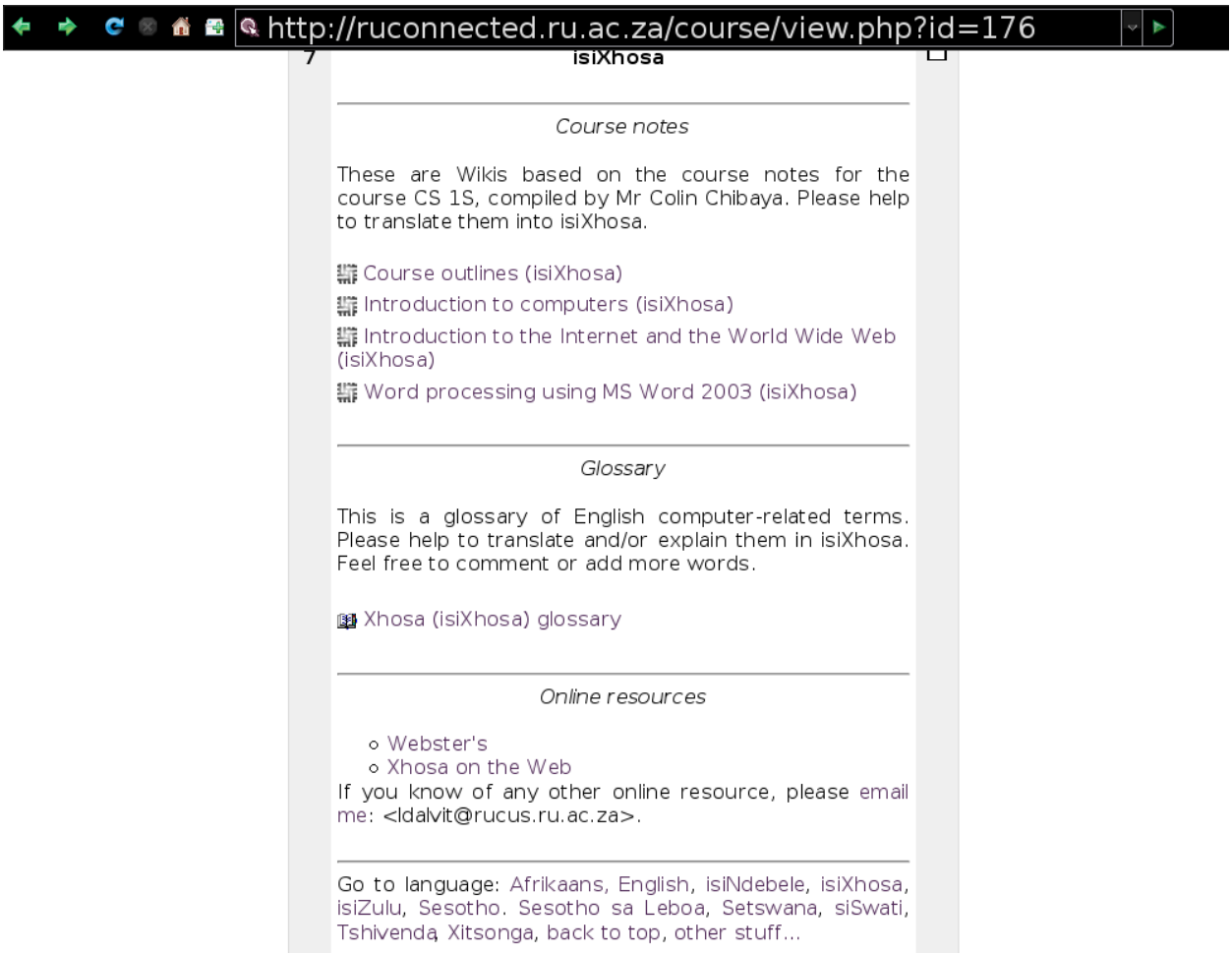
resources to integrate the explanations. Within the scope of an Honours project, they managed to produce a glossary of 100 terms (mainly direct translations of definitions taken from the CS1S handbook) and a set of video tutorials (Kos et al. 2006). These were mainly improved versions of the video tutorials produced by volunteer CS1S students in the first phase. Though lacking linguistics training, these students could rely on the help of a community of translators with whom they interacted via email. Being Honours students, they could also contribute with a more comprehensive knowledge of computers and the related terms compared to the foundation students mentioned above.

Experience in the second phase showed the limits of working with volunteers. Integrating development of material as part of a research project produced better results. More mature students also seemed to understand better the transformative potential of such a project. From the point of view of motivation, these were two crucial points. In terms of productivity, working with a network of people seemed to be a key factor. Although the two Honours students could rely on each other and on communication with professional translators via email, the ideal situation would have been a multidisciplinary team. This concretised only in the third phase.

8.2.2 Moodle and Pootle

In order to allow contributors to work collaboratively on-line, I relied on two Web-based applications. To facilitate participation of CS1S students I used the Moodle server of Rhodes University (http://ruconnected.ru.ac.za). Although working on a server maintained by the university posed some restrictions, I managed to combine all desired functionalities of the application described above into one "course". Moodle, being a Learning Management System (LMS), is primarily designed to support teaching and assessment; for this reason, it only allows power users (called "teachers") to create and maintain "courses". I found that, because of its sound social-constructivist orientation, Moodle is flexible enough to be used as a community-building portal (Dalsgaard 2006). This can be done using its most interactive modules, such as chat rooms, forums and wikis.

Throughout 2006, I developed various versions of the resource. After a few trials, the first usable version was ready by the end of the first term. It catered for all languages and had different sections for interactions, collaborative work, etc. As a consequence, it had a rather convoluted structure. A chat room and a contributors' forum were hosted in the top section, common to every language. This was motivated by the expectation that not many would use them, and that those who did would benefit from communication across language groups. As shown in Figure 10, each language section had three subsections: course note, glossary and additional resources.



The course notes were based on the CS1S handbook and were implemented using a wiki. This is a tool that allows users to edit a document collaboratively on-line. It also keeps track of past changes and allows for backtracking. Once the resource was set up for one language, I replicated it for all the others. Converting the notes into the wiki format was a complicated and time-consuming

job which, in the light of the results, was hardly worth the effort. Without proper guidance, students could not figure out how to proceed, and did not seem to be motivated to do the translations. I feel that a group-based exercise would have been much more fruitful, but this was not compatible with the busy schedule of most Science Extended Studies students.

I integrated all the terms defined in the handbook into the glossary. I did not provide the existing definitions in English because I wanted students to come up with their own and avoid direct translation. The glossary was implemented through the glossary feature of Moodle, which offers all the desired functions. The only limit was the recording of the terms users look for, but that was fixed by a "patch" I created myself and used in the following version (Appendix J). The last section, titled "additional resources", consisted of an index of on-line resources available for each language (e.g. on-line dictionaries, interest group websites, etc.). I found and compiled the index myself before introducing the resource to the students, so that they had ready-made examples of the use of their language on the Web.

For the isiXhosa section, I used part of the material produced in the first phase. Translated sections of the handbook were integrated into the wiki, and the list of (mostly literal) translations of terms was included in the glossary. I also added to the glossary data from various word lists on the Web. As was to be expected, most of the activity concerned isiXhosa. Some isiZulu speakers showed an interest, and there was work done for Sesotho, mainly through the efforts of one committed individual. This prompted the decision, in the second half of the year, to focus mainly on isiXhosa.

The development of the glossary, which eventually became the main component of the system, received a major boost through the input of a Computer Science Honours student at Fort Hare as part of his research project, which I co-supervised (Sam 2007). He worked on it using mainly Pootle (PO-based, On-line Translation and Localisation Engine). This is a tool developed by Translate.org.za for collaborative on-line translation. The tool developed during the course of the research, and by the end of 2006 was capable of suggesting translations from a database of previous work. This allowed the translation of definitions from the CS1S handbook to proceed relatively quickly, and guaranteed some level of consistency. The student could also rely on the help of an on-

line community of translators attached to Translate.org.za. He made extensive use of the mailing list for isiXhosa in order to propose translations and ask for suggestions and feedback.

The combination of Pootle and the mailing list proved to be a powerful one to support this type of work, and gave the student a sense of being part of a larger endeavour. A second Honours project (Kos 2007) focused on the creation of multimedia material to integrate explanations. This used a variety of tools which did not allow for direct integration into the glossary. However, this project contributed to the creation of an isiXhosa-rich ICT environment, and to the building of a language-oriented team within the Department of Computer Science. This sense of being part of a team contributing to social transformation was one of the key success factors in the third phase.

8.3 Phase 3: full-scale intervention

After a number of experimentations and reconceptualisations in the previous years, 2007 was the real *annus mirabilis* for my project. Progress was achieved partly because of the South African – Norwegian Tertiary Education Development (SANTED) programme at Rhodes, which started in the same year. This allowed me to integrate my research in a University-wide project, and to work within a multidisciplinary team of experts (Dalvit et al. 2008d).

8.3.1 A multi-disciplinary team

From the beginning of 2007, my research was integrated as the ICT component of the SANTED programme. This programme provided funds dedicated specifically to the promotion of multilingualism. Perhaps most importantly, it allowed me to work with a dedicated team of experts from various disciplines and with different levels of computer literacy. The four "core" members of the team (excluding myself) were all isiXhosa speakers, and played different roles.

The starting point for content development was the prototype glossary developed as part of an Honours project in the Computer Science Department at the University of Fort Hare during the second phase. The list of terms was considerably expanded and translations were revisited

extensively. Development of the material took place during a number of mini-translate@thons which took place throughout the first semester. During these meetings, the team would sit together for several hours at a time discussing terms and translations until consensus was reached (see Appendix I for an example). I would normally initiate the discussion and, together with the former Fort Hare Computer Science Honours student who had now joined the team, explain the meaning of terms to the rest of the group. An experienced terminology developer led the discussion on the possible direct translations of the term. We would then proceed to creating our own definitions and examples collaboratively. Discussions took place in both English and isiXhosa. By that time, I had gained sufficient proficiency in the latter to follow and contribute to the debate.

Members of the team with lower levels of computer literacy were asked to double-check the resulting entry to ensure the language used and the content itself were accessible. Contrary to an established practice in the translation field, we did not rely extensively on the established practice of back-translation (see Brislin 1970). The few times we experimented with it, we encountered a number of problems. First of all, it proved to be extremely time-consuming. Besides attending the meetings, people had to fit individual work into a very busy schedule. The second problem was that people who were still learning about computers, and were therefore the ideal back-translators, did not necessarily have the appropriate linguistic training. This means that, even though they understood the newly developed isiXhosa explanations and could explain concepts in their own words, they were not able to back-translate into English. A third problem seemed to be power dynamics within the group. The person suggesting the translations was, in most cases, of higher rank within SANTED compared to the people asked to back-translate. Although this never resulted in overt tensions, it is reasonable to assume that it posed questions regarding the validity and critical value of back-translations.

In order to ensure the quality of the material, we relied on three external sources. First of all, we tried to collaborate with the appropriate structures within the government. We met with representatives of the isiXhosa National Language Body in Bisho and of the isiXhosa National Lexicography Unit at the University of Fort Hare. At a later stage, because of the media coverage of the project, we attracted the attention of the Pan South African Language Board, with whom we met to discuss possible synergies. Though important in their own right, these collaborations did not have

a direct impact on the development or evaluation of the glossary. This was partly due to the constraints of bureaucratic organisations, whose mandate is coordination rather than active production and development of material and terminology.

The second channel of quality assurance was Honours students in the Departments of Computer Science and Communication at the University of Fort Hare. As part of their research projects, two CS students worked on the integration of the glossary into multimedia Concept Maps (Mbombela et al. 2007). A Communication student looked at issues of quality in translation, and worked on the glossary as part of her sample (see Gunzo et al. 2007; Madwe et al. 2007). All students were isiXhosa speakers and were asked to comment on the entries in the glossary as a spin-off of their projects. As was the case in the second phase, getting Fort Hare students involved in the project as part of their research proved to be an asset. This expanded the team of contributors/reviewers and brought in different expertises. Being from another institution, these students were completely external to the power dynamics of the SANTED team, and could afford to be more critical.

The third, and perhaps most important, way to check the quality of our work was feedback from the students. This is consistent with the original translate@thon model developed by Translate.org.za and, in general, one could argue it is the way the Internet and the open-source world developed (see Thinyane et al. 2008). The use of ICT allowed us to collect and process feedback quickly and extensively. We relied heavily on this to guide the development of the glossary and to ensure the quality of translations. As discussed later, not all students were ready to give feedback. As shown by the two examples mentioned above (i.e. translate@thon and Internet), a large number of users is needed before this becomes a reliable channel for feedback.

Discussions within the team generated approximately 50 hours of recordings (see Appendix I for an example). By March 2007 the glossary contained 150 entries (Appendix H). Each term was translated, explained and exemplified in isiXhosa. Conscious of the debate around language purism vs integration of borrowings, we decided to include direct translations of the terms whenever possible. The rationale was that, even though students might not use the new terms, it would still be useful for them to have isiXhosa equivalents of the English words in order to grasp their meaning. A survey on this topic was integrated into Master's research by one of the members of the team

(Dalvit et al. 2007b; Sam et al. 2008a; Sam et al. 2008b). Explanations relied heavily on culturally-relevant examples and metaphors in an effort to draw on the students' social context. This is consistent with the tenets of Ethnocomputing and was intended to facilitate understanding and appropriation of the new concepts (see Dalvit et al. 2008a). The glossary was made available both on-line and in print format. Both formats allowed for extensive feedback from the students, including comments and ratings of the entries.

8.3.2 Moodle glossary

The on-line version of the glossary was packaged as a Moodle glossary. This can be exported in Extensible Markup Language (XML) format (see Appendix K for an example). This makes it possible to import a glossary into another Moodle course. This is a useful feature in the case of multiple implementations of the same glossary, as each implementation can be "copied" and merged with another. Moreover, this makes it easy to change settings for all entries at the same time, e.g., require a "whole word matching" for all of them. Exporting and importing through XML, however, comes at the cost of losing formatting (i.e. bold, underline, italics etc.). This means that, once entries are created, modifying them (either one by one though the interface or though the export/import method with subsequent reformatting) can be rather time-consuming.

The glossary module has most of the functionalities envisaged since the initial application. It allows students to rate existing entries and make comments. These are analysed in the last section of this chapter. With appropriate settings, it also allows students to add new entries. Although this is relatively easy for someone who is familiar with the system, the interface can be confusing for new users. There is also an option to hyperlink entries. If one of the terms included in the glossary appears in the definition for another term, it is automatically hyperlinked; by following the link, students are taken directly to the definition for that term. This allows students to browse around interrelated terms, showing the semantic links between them. Another interesting feature of the Moodle glossary is a block displaying a random entry on the front page. This can be used to attract students' attention by displaying a new "Xhosa entry of the day" every time they access the course.

Moodle keeps logs and is capable of generating simple reports for each activity. Unfortunately for the glossary, these record only terms that are hyperlinked from the definition of other terms and that students click on. This is not very useful as, in most cases, students would search directly for the term they were interested in. In this case, the logs would reflect only that a search had been completed (marked as "glossary view"). In order to have more accurate logs, I wrote a "patch" to the Moodle code (see Appendix J). This records every word students look for into a text file.

The on-line glossary had two implementations. The main implementation was within the Moodle course for CS1S students (see Figure 11). This was set up during 2006, partly as a result of my own research. It contained presentation slides, activity sheets, notes, etc. From early 2007, students used the course in class during lectures and tutorials. This solved a problem common to the applications I used in previous years, i.e. the fact that these were not integrated into classroom practice and into the course. Throughout 2007, the glossary was immediately available to the students within an application they were familiar with and they used every day.

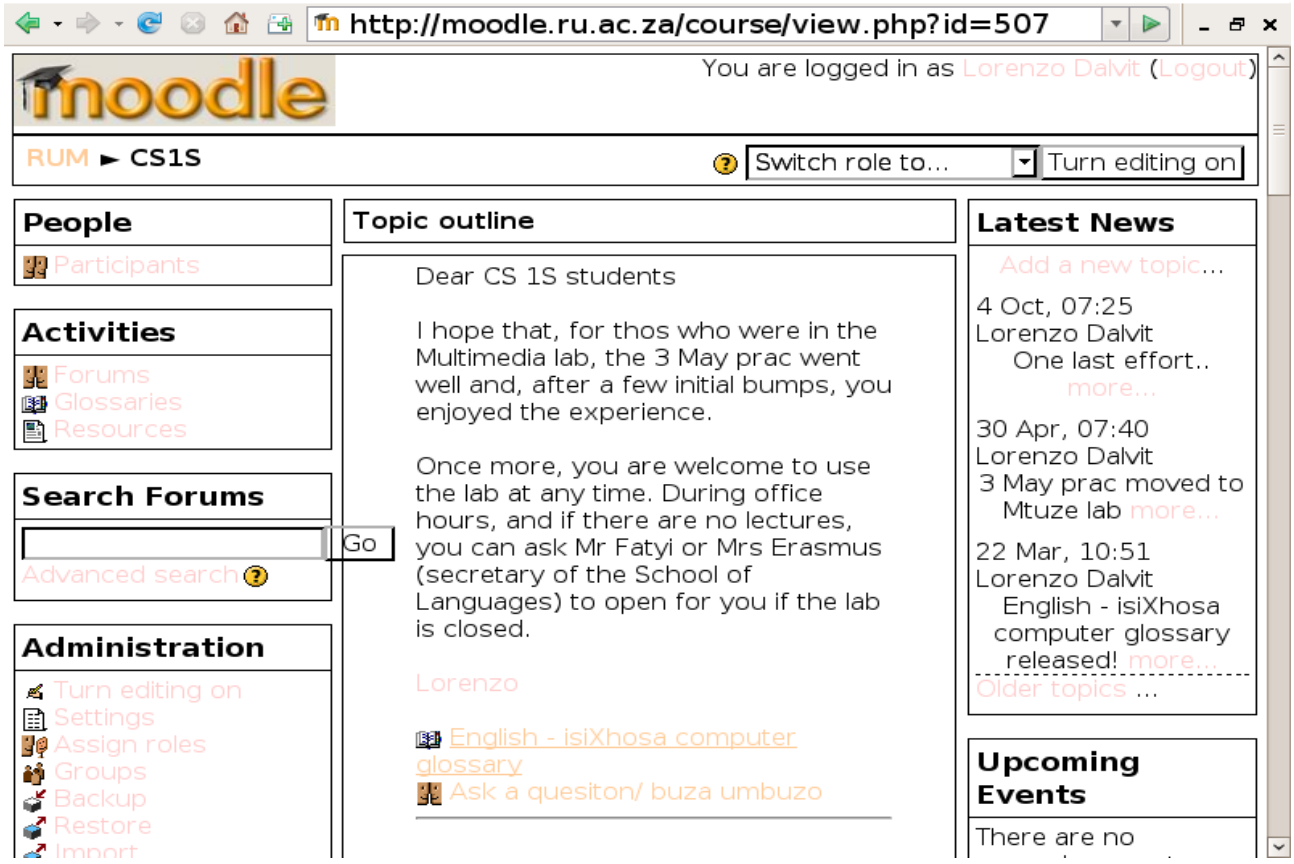


Figure 11: CS1S Moodle course

The chat room module could not be used, as the lecturer was concerned that it would distract students from lectures. Moodle can be set to keep records of all chat room conversations and make chat rooms available only at certain times. The first feature makes it theoretically possible to find out if students misuse the tool to chat about personal matters. However, this would have been very difficult in situations in which students used different languages, some of which were not spoken by either the lecturer, the tutors or the researcher. Moreover, it would have been possible to know only a few days later, when the logs were analysed. It was therefore difficult to make sure students used the chat room for learning in class. In such a small group, making the chat room available only outside lectures and tutorials times would have been pointless, since few students would normally use the application at the same time. The knowledge-base was implemented as a Moodle forum. Although a few students experimented with it and this yielded input for the glossary, it never really became popular in the class.

The on-line glossary was also implemented as a standalone Web application on the Moodle server of the Rhodes Telkom Centre of Excellence (see Figure 12). Unlike most hosts within the Rhodes network, this machine is accessible to users from outside the university and its content is available on the World Wide Web. I installed and maintained the server myself, and unlike in the previous instance, I had full administrative rights. This allowed me to make an important modification. After reading of the Moodle documentation, I managed to "tweak" the system to display the glossary on the home page of Moodle. This made the glossary readily available on the Internet at http://isixhosa.ru.ac.za, under a Creative Commons licence (Creative Commons 2007).

Figure 12: Standalone Moodle-based glossary

Users could log into the system using a Rhodes account, or enrol themselves and create a new account. Registered users could rate and comment on entries, add new entries and access additional features. These included a chat room and a few related projects, implemented as Moodle courses. The Fort Hare Honours students in Communication and Computer Science mentioned above worked on this system, providing feedback.

Alongside its on-line implementations, the glossary was also made available in print format (Appendix H). This was informed by experience in previous years, when students were not familiar with Web applications and did not use them in class. Like the on-line version, the booklet allowed students to rate entries, add comments and suggest new terms. Collecting feedback through the booklets proved to be quite difficult, so students were encouraged to channel their input through the on-line version. They did not show any strong preference for either the electronic or print media.

Making the glossary available in both forms seemed, however, a reasonable way to try to reach students with different levels of confidence in using computers.

8.3.3 Classroom interventions and related events

During the first term, CS1S students familiarise themselves with computers, e-mail and Web applications. The "English – isiXhosa computer glossary" was added to the course in March 2007. By that time one could assume that students would have the necessary level of familiarity with computers to use it. Before being exposed to the glossary, students filled in a language attitudes questionnaire (Appendices D and E) similar to the one used in the survey described in Chapter 7. This served as a baseline for a follow-up questionnaire (Appendices F and G) administered at the end of the year. Comparison between the results for the two questionnaires captured changes in language attitudes.

During a 15-minute slot at the beginning of a lecture, I explained to the students how to use the on-line glossary, and gave them the chance to test it. At the same time, I distributed print copies of the glossary. Initial reactions varied between amusement and enthusiasm; a few students made sarcastic remarks such as "I will give this to my grandmother". Results from language attitudes questionnaires in previous years suggested that an intervention giving prominence to one African language (i.e. isiXhosa) over the others might be perceived to cause tensions among students. I therefore made it a priority, in this first meeting, to explain that I was experimenting with a model which, if proven successful, could be applied to all African languages.

Students were encouraged to use the glossary throughout the year. Reminders were sent through the tutors and lecturer, who fully supported the intervention. However, the proposition to provide students with an isiXhosa version of the mock June exam and to allow them to respond in isiXhosa was met with resistance. More than concern for the practicalities of such exercise, this was motivated by concerns about how the university's administration would react. Another important concern was the fact that, during 2007, students in the foundation programme were the subject of a number of other studies. There was widespread feeling in the Extended Studies Unit that they were

being over-researched. Implementing dual-medium testing in the course (English would necessarily remain the only language of assessment in exams) was beyond the scope of my research. I therefore decided to abandon the idea of a mock exam in isiXhosa. Exclusion of isiXhosa from the high-status domain of assessment was a drawback from the point of view of my research. From an ideological point of view it entrenched the lower status of this language compared to English. From a practical point of view, it made it meaningless to try and measure the impact of my intervention on students' marks.

During the second term, students were invited to write one of their practicals using localised software in their language. This took place in the Peter Mtuze Multimedia Laboratory, hosted by the School of Languages. This is the first computer laboratory at a South African tertiary institution to allow students to operate computers almost entirely in an African language (see Dalvit et al. 2008c). This is possible because of open-source software localised mainly by Translate.org.za. It was not possible to assess whether students used software in English as opposed to an African language for the practical. The impact of this experience was eventually assessed in the follow-up questionnaire at the end of the year and through interviews.

In 2007, Rhodes hosted its first translate@thon (Dalvit et al. 2008c). This was a translations sprint organised by SANTED in collaboration with Translate.org.za and the Telkom Centres of Excellence of Rhodes and Fort Hare. During the weekend of 11 and 12 May a group of approximately 50 students from various disciplines localised the webmail system used by Rhodes University (Horde/Imp) into isiXhosa (see Figure 13). The new version has been added to the webmail server and is currently available to isiXhosa-speaking students and staff. The event attracted extensive media coverage and, as confirmed by the interviews, had a positive impact on the participants' attitudes towards their language.

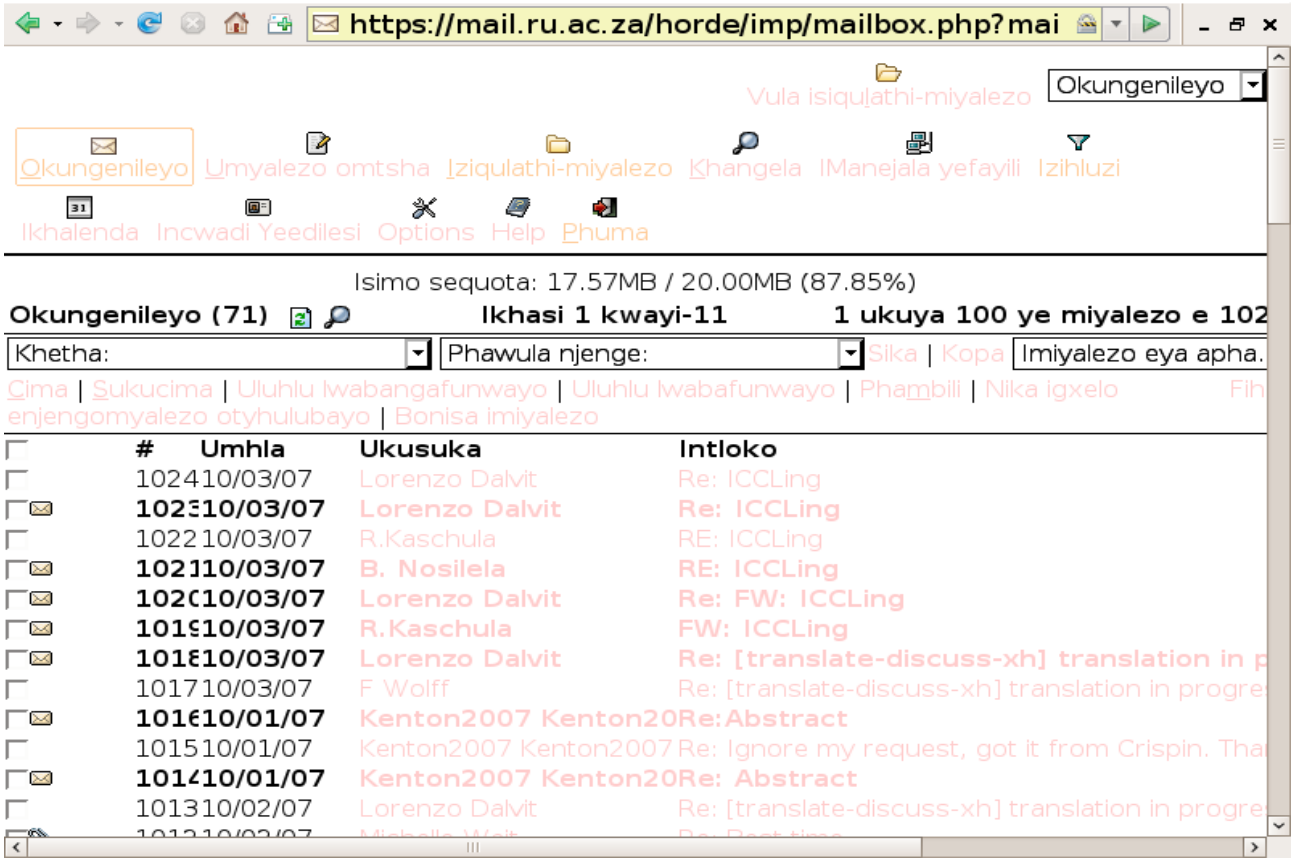


Figure 13: Webmail in isiXhosa

Towards the end of the year students in the focus group were asked to fill in a follow-up questionnaire. This contained questions from the questionnaire they had filled in at the beginning of the year, with the addition of new questions. Students were also invited for follow-up interviews during which they could express their views on the intervention. They were also asked if they would be willing to contribute to the development of their language. The results from this follow-up survey are discussed in the next section.

8.4 Evaluation

Consistent with the action research methodology used in this study, the intervention cannot be considered complete, but is part of an ongoing process which extends beyond the goals of this study. In this section I provide an evaluation of the process so far along two dimensions. First of all, I discuss the feedback obtained from the students and how this informed future developments of the

glossary. Secondly, I compare the responses to the follow-up questionnaire and interviews with those to the questionnaire run at the beginning of 2007.

8.4.1 Glossary feedback

Students in the CS1S course could provide feedback on the glossary either on-line or on the print version. The latter proved difficult to retrieve and time-consuming to analyse, so students were encouraged to upload their written comments and ratings using the on-line version. Only feedback obtained though the two on-line implementations of the glossary is discussed here. Making only the on-line version available would probably have increased the amount of feedback that was actually collected, since this would have all gone though the same channel. However, collecting feedback was only part of the purpose of my study. It seemed reasonable to run the risk of collecting less direct feedback while trying to reach more students by making the glossary available in print.

In 2007, the majority of CS1S students (31 out of 41) were isiXhosa speakers, and 25 of them wrote isiXhosa as their first language in Matric. They were the primary target of my intervention. If one excludes the records for people involved in the development (i.e. members of the SANTED team), the glossary for the CS1S course received 517 "hits". Most of them (502) refer to March 2007, the month in which the students were first exposed to the glossary. The rest of the records are concentrated closer to the mid-year exams, although some students accessed the glossary during the June/July holidays.

Analysis of the records stopped at this point, since the glossary covered only material covered in the first semester. Subsequent logs indicate activity in the period immediately before the interviews, towards the end of the year. A possible explanation for such low usage is that, besides the initial interest for the novelty of the on-line version, students preferred to use the print version of the glossary. One must also consider that only isiXhosa speakers, i.e. 31 students, could actually use the glossary. This means an average of 17 interactions with the glossary for each isiXhosa-speaking student.

Analysis of the records suggest that students followed links from within a definition to see other terms 38 times. These records refer mainly to terms which are part of complex and interrelated systems, e.g. “ALU”, “CPU”. “RAM” and “ROM”. Definitions for two terms (“documentation” and “technical support”) were added by the students themselves. They also used the forum feature to ask for definitions of five terms (“system clock”, “microprocessor speed”, “CMOS battery”, “peer to peer” and “client/server”). Entries for these terms were promptly developed within the SANTED team and included in the glossary.

Students looked for terms 334 times, of which 114 were during the lecture in which they were introduced to the glossary for the first time. Terms looked for included acronyms (e.g. “ALU”), compounds (e.g. “cell address”), sentences (“e.g. “click to add title”), functions (e.g. “countif”), etc. Students searched for common words (e.g. “essay”) and product names (e.g. “Excel”) as well as non-existent words (e.g. “chomi”[8]). Swearwords (e.g. “pussy” and “*isibhanxa*”, which means “fool”) were present but not common.

A considerable portion (44) of the terms students looked for were isiXhosa words. These included isiXhosa-ised English terms (e.g. “*imonitha*” - “monitor”) as well as common isiXhosa words (e.g. “*isonka*”, which means “bread” and “*ingalo*”, which means “arm”). With respect to the latter, in developing isiXhosa equivalents of computer terms we relied heavily on body parts as metaphors. For example, “*ingqondo yekhompiyutha*”, which literally means “the brain of the computer” was used for “CPU”. It is reasonable to assume that most such terms were intended to test the resource rather than genuine searches. The on-line version of the glossary could perform a full-text search, which would find isiXhosa words in the definition of English terms. However, isiXhosa words would be difficult to find in the print version. This would require a duplicate glossary, indexed according to the isiXhosa terms.

Typographical errors and misspellings were common (approximately 50) in both languages (e.g. “formating” instead of “formatting” and “*ikhompuyutha*” instead of “*ikhompiyutha*”). Compound words in English also seemed to be problematic (e.g. “hard ware”, which in one instance was also spelled as “hard wear”, instead of “hardware”). Phonetic spelling led to interesting mistakes (e.g.

[8] This could actually be a phonetic approximation of the isiXhosa word

"sale address" was used four times instead of "cell address"). These types of mistakes, largely due to the discrepancy between the spelling and pronunciation of English words, suggest that students might find it difficult to identify the words they need to look for in a glossary, even when resources are available. This problem could possibly be addressed with voice recognition through an audio interface. This solution would work reasonably well for small databases, such as the one necessary for a basic technical glossary. A larger sample of searches would allow for more interesting generalisations on error patterns.

All in all, students looked for 154 different terms. The most popular "hits" were "word wrapping" (which was one of the examples given during the explanation of how the glossary works), words referring to topics of the course (e.g. "word processing", "spreadsheets", but also "Excel") and pieces of hardware (e.g. "keyboard", "mouse", "monitor"). The choice of terms students looked for depended on the particular point at which they were in their course and on things that, being in front of them, attracted their attention at the time. Out of these, 82 were already included in the glossary. Some of the terms (34) were generic words both in English (e.g. "essay") and in isiXhosa (e.g. "*ingalo*") which did not need to be included in the glossary.

A few terms (e.g. "CMOS" and "documentation") were added during the course of the year, following the indication of students. Entries for terms that students looked for and were not in the glossary (34) were developed by the SANTED team at the beginning of 2008. Consistent with experience in the previous phases, students had limited possibilities to actively and independently contribute to the glossary. However, terms they looked for provided a good starting point for the future development of the glossary. Moreover, one former CS1S student volunteered to participate, and in 2008 he joined the team of developers.

Students did not give any direct comments, but rated 36 of the 150 entries. Each entry was rated by a minimum of one to a maximum of three students, although only 13 entries received more than one rating. Entries on the first page, being more readily available, received a proportionally higher rating than the rest of the glossary. The average rating was 4.41 on a scale from 1 (very poor) to 5 (very good). For entries that received more than one rating, standard deviation between the marks was taken into account. Values varied from 0 to 2.83. This means that, while there was considerable

agreement about the quality of some entries (i.e. “Keyboard”, which scored 5), opinions differed for others (e.g. “directory”, which ranged from 1 to 5), even within such a small sample.

The standalone version of the glossary, freely available on the World Wide Web, received 7907 hits. Most records probably reflect hits from search engines or web “crawlers” from virtually every country in the World (United States, Netherlands, Poland, New Zealand, Puerto Rico, etc.). At least 1382 were searches, i.e. they were done by “real” users. These data exclude members of the SANTED team and Fort Hare students involved in the development. Most of the ratings and comments in the standalone application were given by the latter. No other users created new accounts in order to be able to rate entries and add comments.

8.4.2 Shift in general attitudes

In an attempt to gauge the impact of my intervention, CS1S students were administered two questionnaires: one before and one after the intervention, followed by interviews. The first questionnaire was a revised version of the one used in 2005 for speakers of African languages. The 21-item questionnaire was available in both English (Appendix D) and isiXhosa (Appendix E). It was administered on-line through the CS1S Moodle course. Out of the 42 students enrolled in the course, 38 filled in the questionnaire. Students had 15 minutes to fill in the questionnaire in class, although they could finish it in their own time.

The second questionnaire was also available in two languages (see Appendices F and G). It included a subset of questions from the first one as well as new questions, mainly related to the glossary. In an attempt to maximise the collection of feedback and to avoid the problems experienced with the on-line version, this time the questionnaire was administered in print format. This yielded a response rate of 33 out of 42 students. When compared to the figure for the previous questionnaire, however, it should be noted that the follow-up questionnaire was completed by all students attending the class on that particular day. Informal communication with the lecturer confirmed that attendance was generally poor throughout the year.

Figures for all background variables were consistent with the available statistical data for the class. Distribution according to area of provenance (25% urban, 54% semi-urban and 21% rural) and type of school attended (71% former "Black", 8% former "Coloured" and 21% former "White") obviously remained the same in both questionnaires, as did those for home language. These figures suggest that the majority of the foundation students attended EL2 schools. This is consistent with the statistical data available from the university.

The majority (17, i.e. 74%) of the students spoke isiXhosa. Although only 2 students indicated English as their home language at registration, 5 indicated it as their home language in the questionnaire, invariably in combination with an African language. This suggests that, when given the option, respondents did not indicate English as their *sole* home language, but chose it in combination with isiXhosa.

In spite of the practical which took place in the Peter Mtuze Multimedia Lab, which features software localised in all eleven South African languages, only 7 students out of 32 (i.e. 22%) reported having used software in their language by the end of the year. Given the wording of the question, this might imply that students did see the localised software but, in order to complete their practical on time, preferred to use the English interface they were familiar with. This was partly confirmed during follow-up interviews, although some students had not understood that software was available in their language, and others deliberately refused to use it.

Several students (12) added comments on localised software. These ranged from enthusiastic support (e.g. "it was so impressive", "I think it would make me understand things better") to scepticism (e.g. "I haven't used it because it wouldn't make sense to me"). Most criticism concerned the terminology used (e.g. "the terms seem much much more complicated in isiXhosa"). During the follow-up interviews, one student commented enthusiastically that seeing software in his language was "like when you are in a foreign country and you meet someone who speaks your language".

Low turnout at the translate@thon organised in March 2007 (see Dalvit et al. 2008c) seems at odds with the indication, given by 25 students, that they would be happy to participate in the development of their language. Although the event was repeatedly advertised in class, 22 out of 31

respondents (i.e. 71%) claimed they did not know about the translate@thon. This could mean they had either forgotten about it (the translate@thon took place in May, while the follow-up questionnaire was administered in October), or they did not pay attention to it. Five respondents (i.e. 16%) did know about it, but decided not to go. An additional 3 (i.e. 10%) did attend the initial talk, but not the translate@thon. Only one student took part in the translate@thon, although it is reasonable to assume that the extensive media coverage received by the event reached a larger portion of the sample.

As shown in Figure 14, comparison between the two questionnaires points to a positive shift in attitudes towards African languages, but reflects the discrepancy between practice and policy discussed in subsection 2.3.1: confidence in speaking about computers in one's mother tongue was not matched by increased support for mother-tongue education. The number of those who believed they could speak about computers in their mother tongue increased from 6 (i.e. 21%) in the first questionnaire to 14 (i.e. 44%) in the second. This is particularly significant if one considers that, while in the first questionnaire no respondent agreed *strongly*, in the second an equal number ticked the “agree” and “strongly agree” option. Besides my intervention, this could be due to the fact that, after attending the course, students felt more confident about speaking about computers in any language. The number of those who believed their language should be used more in education increased from 17 (i.e. 58%) to 21 (i.e. 67%). However, in this case the increase was due to a higher number of students ticking the “agree” box.

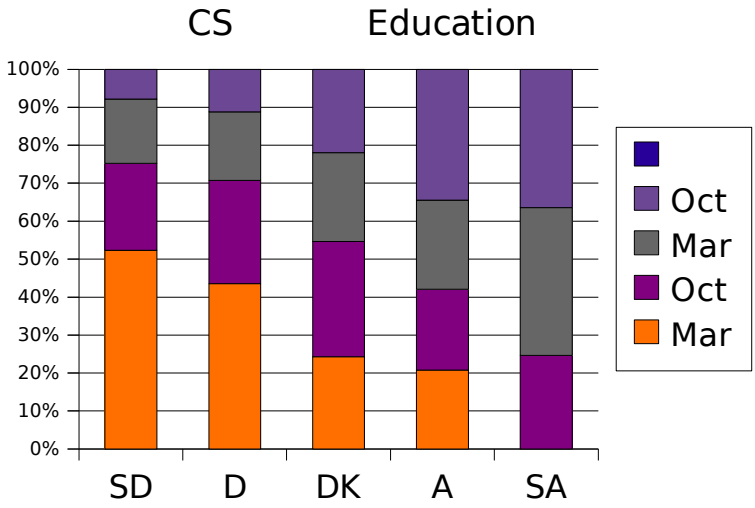


Figure 14: Use of MT in... (March => October 2007)

In both questionnaires, respondents were asked to rank possible problems associated with using material in the African languages in the teaching and learning of Computer Science. As shown in Table 13, on a scale 1 to 5, the average for all problems showed little variation, decreasing from 3.2. to 3.1. Results indicated that being exposed to resources in an African language increased ranking for some of the possible problems (see first, second and third row). At the same time, this experience helped students to deconstruct some of the arguments perpetuating the exclusion of African languages from the academic domain (fourth, fifth and sixth row).

Table 13: Main problem in using African languages for CS

	March	October	Diff.
Difficult to understand	**2.5**	**2.8**	**+0.3**
Not enough English	**3.3**	**3.5**	**+0.2**
Expensive	**2.8**	**2.9**	**+0.1**
No lecturers	**3.1**	**2.8**	**-0.3**
Speakers of other languages	**4**	**3.7**	**-0.3**
No terms	**3.4**	**2.7**	**-0.7**
Average	**3.2**	**3.1**	**-0.1**

The belief that using resources in the African languages would entail lower levels of English proficiency ranked consistently highest (3.3 and 3.5). As discussed in Chapters 3 and 7, this can be seen as a reflection of the linguistic hegemony of English. The perception that material in an African language would be difficult to read and understand was the one which increased the most as a result of my intervention. This raises concerns about the quality of the material I used rather than the idea of using resources in an African language.

My intervention countered some of the arguments against the use of African languages in the academic domain. Figures reflecting the fear that this kind of intervention would create tensions with speakers of other languages, which ranked as the most important problem in both questionnaires, decreased from 4 to 3.7. As confirmed in the follow-up interviews, students seemed to understand that this was a model which could be applied to any language. This is consistent with the fact that all the 8 speakers of African languages other than isiXhosa in the sample invariably agreed that the glossary we developed should be replicated for other languages. Not surprisingly, ranking for lack of terminology in the African languages as a problem was the one that decreased the most, from 3.4 to 2.7. Deconstructing the argument of lack of terminology as a reason to exclude African languages from the ICT domain was probably the main contribution of my intervention.

8.4.3 Feedback on the glossary

Respondents were asked to rank the perceived usefulness of various types of additional teaching and learning material in an African language for Computer Science (see Table 13). On a scale 1 to 5, the average for all types of material showed little variation, decreasing from 3.7 to 3.6. Exposing students to software in their mother tongue increased their perception of its usefulness. Table 14 shows that localised software, while ranking the lowest in both questionnaires (3.1 and 3.5 respectively) was the only resource for which perceived usefulness increased. The 7 students who reported using localised software ranked its usefulness higher than the average for the sample (3.7

as opposed to 3.5) and commented positively on it (e.g. “It was a little bit different than usual, but in a good way”).

Table 14: Perceived usefulness of various resources in African languages

	March	October	Diff.
Localised software	**3.1**	**3.5**	**+0.4**
Audio/ video explanations	**3.8**	**3.7**	**-0.1**
Booklets	**3.7**	**3.5**	**-0.2**
Glossary	**4.3**	**3.8**	**-0.5**
Average	**3.7**	**3.6**	**-0.1**

Figures referring to a glossary of computer terms explained in an African language raised concerns about the quality of the material I used in my intervention. A glossary was consistently rated as the most useful in both questionnaires (4.3. and 3.8). However, exposing students to a practical example of it seemed to decrease its perceived usefulness more than was the case with other types of resources. While the vast majority (24 out of 31 respondents, i.e. 80%) agreed that the glossary we developed was a good idea, only two-thirds of those who used it (16 out of 24, i.e. 66%) agreed it was of good quality and easy to use.

Responses to the follow-up questionnaire confirmed a tendency, noted in Chapter 7, to consider the use of African languages as LoLT suitable “for someone else”. Among students who claimed they did use the glossary, only 7 out of 23 (i.e. 30%) believed that the glossary could help them, while 16 (i.e. 70%) agreed it would be useful for others. It is reasonable to assume that this attitude was even stronger among isiXhosa-speaking students who chose not to use the glossary at all.

Of the 12 respondents who claimed not to have used the glossary, 5 indicated they did not speak isiXhosa as the main reason. The interviews revealed that one of them was an isiXhosa speaker who attended EL1 schools. An additional 6 respondents claimed they did not need the glossary, and only one indicated he or she preferred to use English. Comments seemed to be more favourable among

non-isiXhosa speakers (e.g. “if there was one in Tshivenda I would use it”) than among isiXhosa speakers (e.g. “I cannot read isiXhosa”).

As noted in the previous subsection, actual use of the glossary was difficult to assess. Out of a total of 33 respondents to the follow-up questionnaire, 24 answered questions for those who used the glossary and 12 answered questions on why they did not use the glossary. The interviews clarified that the overlap of 3 respondents could be explained by the fact that some people used the glossary at least once, but were still in a position to explain why they did not use it further.

Responses did not give a clear indication of which format is best to use for the glossary. A roughly equal proportion (one quarter) of those who used the glossary preferred the print or the on-line version. For the remaining half of the respondents it did not seem to matter. One of the suggestions for improvement (i.e. **“**You could make its own web page and not just on Moodle”) pointed to the need for a standalone application. Although this had already been set up, CS1S students were not made aware of it. This avoided confusion and streamlined all the feedback through the on-line glossary in their course.

Comments in the first questionnaire ranged from mild optimism (e.g. “I think it could be useful if we get a chance to use computers in our language though it might be a little bit hard at first but it's always okay to learn new things”) to scepticism (e.g. “it would be a great idea to see material produced in our home languages, but also an impossible task”) and categorical rejection (e.g. “it is better to learn in English”). Students emphasised that English was the main language in the ICT domain. A few respondents mentioned that having somebody to explain things in their mother tongue would help. This is consistent with high ranking for the usefulness of such a solution, which matched the rankings for the glossary in the second questionnaire (i.e. 3.8). However, this reinforces rather than challenges the traditional association of African languages with orality and low-status domains.

Comments on both questionnaires emphasised two issues noted above. First of all, respondents felt that the use of African languages as LoLT could help “others”, either students with lower levels

of computer literacy or students at lower levels of education. Secondly, respondents to both questionnaires emphasised the need to make resources available in all languages, not to create tensions between speakers of different languages (e.g. “It would be unfair to other people who do not speak my language”, “There are a lot of official languages and all of them would need to be accommodated”).

Comments to the follow-up questionnaire were generally more positive than in the first one. Most comments were favourable to the use of African languages, and remarks about the impossibility of using such languages in the ICT domain were virtually non-existent. Another noticeable difference is that many more students wrote their comments in isiXhosa. This is consistent with the fact that the number of respondents who filled in the isiXhosa version rose from 5 (i.e. 13%) in the first questionnaire to 14 (i.e. 42%) in the second. This appears to be a significant difference, and could be considered an indicator of a shift in the students' attitudes.

Three points emerged strongly in the feedback, both in English and in isiXhosa, in the second questionnaire. First of all, it was clear that both English and African languages had to be used at the same time (e.g. “*ukuba ulwimi lwesiNgesi lunokusetyenziswa kunye nesiXhosa kungabhetele*”, which means “if English were used together with isiXhosa it would be better”, “I think it would be good to use my language with English because I personally experienced this in primary and high school and if there is a shortage of lectures I am willing to volunteer myself”). Emphasis on using *both* languages is consistent with the fear that using African languages would entail lower levels of English proficiency. As noted above, this fear was reinforced by the actual example of teaching material in an African language.

The second point which emerged from comments to the follow-up questionnaire is the difficulty of the words used (e.g. “simplify the language”, “*nisebenzise amagama alula esiXhosa*”, which means “use simple Xhosa words”). Although every effort was made by the SANTED team to use simple and common words, further efforts in this direction could address the concerns students raised about the quality of the glossary. As mentioned above, issues of quality might have hampered the perceived potential usefulness of the glossary. This could be achieved through innovative

strategies, such as getting students to collaborate with the SANTED team and participate in the translate@thons to develop the glossary.

The third point which emerged from feedback to the follow-up questionnaire is that students wanted to be involved in the process (e..g "You can always ask every student that knows Xhosa to help you with vocabulary"). Low turnout at the translate@thon held in May 2007 and little usage of the localised software in the Peter Mtuze Multimedia Laboratory raise concern about the actual commitment of students. However, positive comments indicate a willingness to counter the linguistic hegemony of English by showing support and voicing one's opinion. This is confirmed by the fact that 25 respondents (i.e. 76%) left their details in order to be contacted for an interview.

8.4.4 Follow-up interviews

Follow-up interviews were conducted between the end of October and the beginning of November 2007. Out of the 25 students who left their details in the questionnaire, 15 were contacted for 5 individual and 5 group interviews. The latter involved two interviewees each and, in spite of various efforts, it was not possible to organise interviews with larger groups.

The interviews served a number of purposes. First of all, they were used to probe the responses to the questionnaire. They confirmed most of the observed trends and included interviewees with a wide spectrum of different orientations. Among speakers of isiXhosa, these ranged from the scepticism of a student who had attended EL1 schools, and did not see much point in using an African language at university, to the enthusiastic position of a student from a rural area who took part in the translate@thon. Non-isiXhosa speakers were supportive of the initiative, and seemed to understand that this was the experimentation of a model which could be used for languages other than isiXhosa. This was a crucial point to assess since the fear that promoting isiXhosa might create tensions with speakers of other languages emerged strongly from the questionnaire.

Most isiXhosa speakers indicated using the glossary, though it was not clear to what extent. Some non-isiXhosa speakers, mainly speakers of isiZulu, also reported looking at it and thought it

was a good idea. There was no clear indication of whether students preferred the print or on-line version, although the former was more readily available when preparing for tests. It made little sense to ask whether the glossary had any impact on performance, since it was an optional resource. Comparison of the CS1S marks for the 2006 and 2007 cohort confirmed that there was no noticeable variation in the marks of isiXhosa speakers compared to those for speakers of other languages.

Interviews were also used to spark debate and awareness about language issues. For this reason, the goal and scope of the research were explained while keeping an open attitude conducive to debate. Moreover, every effort was made to combine students with potentially different views in the group interviews. In spite of this, students were not willing to challenge each other's or the interviewer's views, but rather tried to reach consensus quickly and used their time to ask about the intervention. As in the questionnaire, several interviewees offered to help in future interventions. One of them eventually joined the team of developers and played an active role in the translate@thons to expand the glossary.

During interviews, students were asked about their experience at Rhodes and in the foundation programme, with specific reference to the Computer Skills course. Various interviewees indicated that the first experiences at Rhodes were quite challenging, and language issues emerged as part of the problem. Responses highlighted some level of initial resentment towards the foundation programme among a few students. Perceptions of the experience in the Computer Skills course varied, mainly depending on whether students had previous experience of computers or not. Some parts of the course (i.e. spreadsheets and Python programming) were considered more problematic than others. This might be an indication that the SANTED team would need to focus on these areas for future expansions of the glossary.

8.5 Summary and conclusions

In this chapter I describe the three phases of my intervention and the evaluation of the final phase. In the first phase, I conceptualised my intervention and experimented with some tools. From the point of view of developing the content, the main lesson learnt in this phase was that reliance only

on volunteer students could not bring the necessary commitment and level of expertise for the project. For this reason, in the following phase, I integrated this aspect into two research projects. From the technical point of view, the application developed during this phase was not an integrated system, and could not really be used in class. This experience highlighted the need for a comprehensive, lightweight application that could be integrated into classroom practice. For this reason, in the following phase I turned to Moodle.

During the second phase, it became clear that trying to cater for speakers of all African languages at once was not a viable solution. I then decided to focus on isiXhosa, and rather emphasise with speakers of other languages that the same model could be used for their mother tongue. Integrating content development into research projects and making use of collaborative ICT tools (i.e. mailing lists, Web applications) proved to be major assets. Moodle became the reference system for my intervention although, at this stage, it was not yet used by CS1S students in their course.

In the third phase, my research was integrated as part of the activities of the new SANTED multilingualism programme at Rhodes. This made it easier to organise practicals using localised software and a translate@thon, which formed part of my intervention. I could rely on a dedicated multidisciplinary team of experts for the development of content for the glossary. This was made available to foundation students in print and through their Moodle course.

Analysis of language attitudes suggests that my intervention in the third phase mildly improved students' attitudes towards the use of African languages in the ICT domain. This was supported by the higher number of students who filled in the isiXhosa version of the follow-up questionnaire and wrote comments in isiXhosa, as well as by the comments themselves.

Attitudes towards the use of African languages as LoLT showed mixed orientations. The fear that using African languages as LoLT would entail lower English proficiency remained strong. However, fear of possible interlinguistic tensions decreased, as did perceived lack of terminology in African languages. The latter two are important arguments, often used to entrench the linguistic hegemony of English and perpetuate the exclusion of African languages from the academic domain.

Data on the actual usage of the glossary were inconclusive, and it appears that its quality needs to be improved by further simplifying the terminology used, and by involving students in the development of the material, possibly in collaboration with the SANTED team. The evaluation is by no means conclusive, and should not be seen as the final outcome of my research, but as a step in the cycle of development of both content and intervention. This process is not concluded. Possibilities for future developments are discussed in the next chapter, together with more general conclusions.

CHAPTER 9: CONCLUSIONS

In this chapter I summarise and discuss my findings in terms of my research goals, i.e. gaining a better understanding of hegemonic relationships at tertiary level and challenging the hegemonic role of English in ICT education. I conclude by making suggestions for future developments and research.

9.1 Deconstructing hegemonic relationships

Gramsci saw education as a tool for the reproduction of existing power structures in society. My research confirmed that tertiary education in a high-status field of study entrenches inequality between White and Black students in South Africa. Hegemonic relationships between White speakers of English and Black speakers of an African language are reflected by students' performance in Computer Science. As discussed in Chapter 6 (see subsection 6.2.2), English-speaking students had better marks and higher pass rates than speakers of an African language.

Proficiency in English seemed to determine Black students' performance. For Black students, Matric results for English were a better predictor of academic success in Computer Science than results for Mathematics (see sub-section 6.2.3). This is surprising if one considers that results for Mathematics are the main criteria for admission to the study of Computer Science. English proficiency is often associated with one's educational background.

However, providing access to better education and English proficiency for speakers of an African language does not challenge hegemonic relationships between Whites and Blacks. Black students who attended EL1 schools still performed poorly compared to White students. The university experience (and the foundation programme for those enrolled through it) enabled Black EL2 students to compete on an equal footing with Black EL1 students from second year onwards. However, regardless of their educational background, (Black) speakers of an African language could never yield similar performance to that of (White) English speakers.

The assumption underlying my study is that using African languages as additional LoLT could improve the performance of Black students in Computer Science. This assumption is based on the academic argument related to language in education, presented in Chapter 2 (see subsection 2.3.1). However, one of the arguments against the use of African languages in high-status domains is negative attitudes among their speakers.

Consistent with a definition of hegemony as domination which rests on acceptance by those who are dominated rather than coercion, students who appeared to be academically disadvantaged by the use of English as the sole LoLT opposed the possibility of using an African language. Black EL2 students, especially in their first year, showed little confidence in their English proficiency, and performed poorly compared to other students. Black EL2 students were also the least supportive of the use of African languages in education.

Black EL1 students expressed a positive orientation towards the promotion of African languages in principle, but displayed a general tendency to consider the use of such languages as LoLT more suitable "for someone else". Although the academic performance of Black EL1 students in Computer Science was comparable to that of Black EL2 students, they had similarly positive attitudes towards African languages as those of White EL1 students. This seems consistent with the belief among Black EL1 students that an intervention involving a more extensive use of African languages as LoLT would not concern them.

An argument against the use of an African language as LoLT is that such use could create tensions with speakers of other African languages. This argument emerged in academic debate (see subsection 2.3.2), in previous studies on language attitudes (see subsection 3.2.2), and in my own research (see subsection 7.2.3). The use of English as a *lingua franca* supposedly prevents tensions between speakers of different African languages. However, the statistical analysis presented and discussed in Chapter 6 suggests that the use of English keeps speakers of such languages "equally disadvantaged" while entrenching the advantage of English speakers. Findings discussed in Chapter 7 (see subsection 7.2.3) suggest that fear of possible interlinguistic tensions was more common among speakers of isiXhosa (the language most likely to be actually used as LoLT) than speakers of other African languages. This confirms the tendency among students who see themselves as the

most likely target of an intervention involving the use of an African language as LoLT to support arguments against this type of intervention.

Another argument against the use of African languages in the academic domain is the lack of scientific and technical terminology in such languages. Development of ICT terminology in African languages is a contentious issue, and highlights the hegemonic relationship between English and African languages in the field. Based on my findings (see subsection 7.2.3) students were divided on this issue. On the one hand, development of new terminology would contribute to the intellectualisation of African languages, and increase their status (see subsection 4.1.1). On the other hand, it is doubtful whether students would actually use such terminology, or rather preferring to rely on English borrowings. Comments to the questionnaires discussed in Chapter 7 expressed concerns that, if students familiarised themselves with technical terminology in African languages, they would not be able to function in an English environment.

Negative attitudes towards the use of African languages as LoLT seemed to be motivated by a concern that African languages would replace English in the education of Black students, and that this would entail lower levels of English proficiency (see subsection 7.2.2). As noted in Chapter 2 (see subsection 2.1.2), the belief that only one language should be used as LoLT is a reflection of linguistic dependency on Western monolingual models. In my research, students' attitudes towards the use of African languages as LoLT improved when it was explained that an African language could be used alongside English in a bilingual model, and that such a model could be applied to all African languages.

Students supported the use of African languages as additional LoLT in specific domains rather than full equality with English. This orientation emerges in previous studies on language attitudes (see subsection 3.2.2) as well as in my research. It is consistent with the fear that extensive use of African languages would prevent Black students from improving their English proficiency. Rather than the provision of courses taught in African languages, students supported the development of additional teaching material. A glossary explaining English technical terminology in an African language was the preferred format for such material.

Learning technical terminology emerged as an interesting issue. Rauchas et al. (2006, see subsection 3.1.2) speculate that difficulties in learning English technical terminology play a major role in determining the poorer performance of speakers of English as a second language compared to speakers of English as a first language in Computer Science. Evidence that speakers of an African language rely on their mother tongue in the "unpacking" of new concepts, which is central in learning scientific academic discourse, is discussed in previous studies (see subsection 4.2.3) and was confirmed by my research (see section 7.1). Understanding new technical terms seemed to be a challenge particularly for Black EL2 students (see subsection 7.2.2).

9.2 A counter-hegemonic intervention

The purpose of my intervention, discussed in Chapter 8, was to challenge the linguistic hegemony of English in the ICT field. Since hegemony rests on acceptance of domination by those who are dominated, I focused on changing attitudes towards the use of African languages as LoLT. Attempting to improve the academic performance of Black students in Computer Science would have required a much broader intervention, beyond the scope of my research.

Developing additional teaching material in an African language proved to be manageable within the scope and constraints of my research. This material took the form of a glossary of 150 ICT terms translated, explained and exemplified in isiXhosa, available in both print and electronic format. It served the purpose of getting speakers of an African language involved in the development and use of resources in their mother tongue.

The good quality of the resources in African languages developed and used in my research was a key concern. The association between African languages and poor quality entrenches the linguistic hegemony of English (see subsections 2.3.2, 2.4.2, 3.3.1 and 4.1.1). My assumption was that high-quality resources in African languages would have a stronger positive impact on the attitudes of their users.

I targeted students in the computer course of the Rhodes foundation programme. These were mainly Black EL2 students. Because of the emphasis placed by the foundation programme on

mastering the academic discourse and gaining proficiency in English, students in this course had more negative attitudes towards the use of African languages as LoLT compared to other Black students. Through my intervention, I managed to improve the attitudes of a group of such students towards the use of an African language as an additional LoLT in the English-dominated field of ICT (see subsection 8.4.2).

This finding could constitute an argument to support a more extensive use of African languages as LoLT in other fields of study and at lower levels. Black students might accept (and support) the hegemonic role of English as the sole LoLT in tertiary education partly because they have never been exposed to resources in African languages. A small-scale intervention such as the one described in my thesis could improve the language attitudes towards African languages expressed by a comparatively "pro-English" group of Black university students in an English-dominated field of study. Expressed language attitudes which favour a more extensive use of African languages can be used to support arguments to change language policy (see subsection 2.4.2),

My intervention challenged some of the arguments commonly used to exclude African languages from the academic domain. Support for the belief that African languages do not have appropriate technical terminology, and that developing such terminology would be problematic, decreased. This is not surprising, if one considers that providing isiXhosa equivalents of English technical terms was part of my intervention. Comments by the students raised concerns about the quality of the isiXhosa terminology developed. A more systematic evaluation of the quality, adoption and use of such terminology requires further investigation.

Support for the argument that using one African language would create tensions with speakers of other languages also decreased. Explanations in class and first-hand experience of resources in an African language seem to have clarified in the mind of students that, once tested with isiXhosa, a similar model could be used for other African languages (see section 8.4). One could also speculate that students did not see the availability of material in their mother tongue as an advantage, but rather as an additional resource which required "investment" of their time and energy (see sub-section 2.4.1). At this stage, speakers of African languages which are not represented might not see a reason to complain.

Exposing Black students to resources in an African language seemed to increase the concern that their use would entail lower levels of English proficiency. This was only a minor variation and could be attributed to slight changes in the sample of respondents. Reliable data on the actual use of the glossary (especially in its printed format) is not available. However, because of its scope and quality, it is unlikely that the material developed as part of my intervention could substitute the existing material in English and detract from improving English proficiency.

My study highlighted a discrepancy between expressed attitudes and action (see subsection 2.4.1). Students (especially those who attended EL2 schools) expressed an interest in getting involved in initiatives to use and promote the role of African languages in the ICT domain. However, only a small portion (different every year) of the target groups actually participated. Low levels of participation could be explained by the fact that the schedule of foundation students is very busy, and that activities to promote the use of African languages were not part of the curriculum.

In the initial phase of my project, reliance on volunteer students for the development of material inspired by previous interventions (see subsection 3.3.2) showed two types of limitations. First of all, only a small group of students volunteered, and they could only dedicate a limited amount of time to the project. The amount of material which could be developed was therefore limited. Secondly, reliance on students entailed low levels of quality. This is not surprising, as the volunteer students were still in the process of learning the new ICT concepts themselves. The project developed mainly through integration with postgraduate research projects, and with a university programme dedicated to the promotion of multilingualism. Integration of my research with the SANTED multilingualism programme allowed me to tap into the expertise of a dedicated team of experts in various disciplines.

By getting involved in my project, a team of young researchers from both Rhodes and Fort Hare Universities developed an academic interest in the role of African languages in ICT education. Collectively they made a contribution to the project quantifiable in 32 academic publications (see Appendix L). As a result of my involvement with the SANTED multilingualism programme, modules on the role of African languages in the ICT domain have become part of the undergraduate and postgraduate courses offered by the African Studies Section of the Rhodes School of

Languages. Fostering research and teaching around multilingualism in ICT education at Rhodes University has been one of the main contributions of my research to challenging the linguistic hegemony of English.

9.3 Further developments and research

The expansion and improvement of the glossary is now part of the activities of the SANTED programme and will continue beyond my research. It will be shaped mainly by feedback from the users. Integration of multimedia and Concept Maps, initiated as part of research projects, is still on-going. Print as well as electronic copies of the glossary have been distributed at neighbouring institutions with a higher proportion of isiXhosa-speaking students than Rhodes University (Walter Sisulu University, University of Fort Hare). The SANTED team has recently been contacted by provincial government structures in the Western Cape province. They are willing to acquire the published version of the glossary, when available, for distribution in various libraries in the province.

Wider use and better integration within course structures promises to allow resources in the African languages to have a stronger impact on the attitudes of students towards the use of such languages as additional LoLT. In 2009, the glossary will be distributed to isiXhosa-speaking students in all first-year computer courses. Use in Computer Literacy and Computer Science 101 will work on a voluntary basis. The established working relationship with the staff teaching foundation courses, the small size of classes and the use of Moodle will facilitate integration with current teaching practice within the Extended Studies Unit. As a result of my research, staff members in other departments (Economics, Politics) approached the SANTED team to have similar glossaries developed for their disciplines and integrated in their courses.

For the reasons explained in my thesis, a reasonable outcome to expect of such interventions would be an improvement of support for African languages. However, a larger-scale intervention and better integration within the course structure might provide opportunities for research into the impact of additional teaching material in the African languages on students' marks. While attitudinal change among Black students is a precondition for the success of any such intervention, improved

performance would be a strong argument in favour of a more extensive use of African languages in tertiary education. This might entail conducting the assessment partly in an African language, which would provide opportunities for interesting research.

The tendency among students to consider the use of African languages suitable "for someone else" suggests a focus on lower levels of education. In Chapter 8 I mentioned that my intervention was integrated with various postgraduate projects. A Master's student is currently researching the development and implementation of new terminology in isiXhosa (Sam et al 2008). Such terminology was developed as an integral part of the glossary I used in my intervention. A second Master's student is currently researching the attitudes of teachers and students involved in a bilingual (English and isiXhosa) computer literacy course. Both studies focus on isiXhosa-speaking students in secondary schools in townships and rural areas.

Acquisition of computer literacy in a second language (i.e. English) would constitute a new and interesting area of research. It could draw on the experience of other forms of literacy, for which a rich literature is available. Research in this area could inform future use of African languages to scaffold the acquisition of computer literacy among Blacks. A focus on concept literacy, emphasising the role of key terms and the relationships between them in a systematic way, could inform such a study. The main foreseeable challenge would be to strike a balance between the use of the two languages of bilingual students.

Localisation of software in the African languages, still in its initial stages, promises to open exciting possibilities for research. As mentioned in Chapter 4, the comparison between proprietary and open-source software can highlight the implications of different ideological approaches to software development for minority languages. The parallel between open-source and minority languages shows intriguing similarities. For example, users of open-source software are usually compelled to become familiar with widely used proprietary software (such as Microsoft's), just as speakers of less powerful African languages often have to be bilingual in English and their mother tongue. Another example is that, even in situations where open-source software would be more appropriate, Microsoft products are generally used because "that's what everybody uses all over the world". Likewise, even in cases in which African languages offer more accurate descriptions

because of their grammatical structures, English is used because of its hegemonic role. Although these are just speculations, a more rigorous study of the parallel between software and linguistic hegemony would constitute an original and interesting piece of research.

Research on the use of localised software in African languages and on its educational value is needed. At this stage, as mentioned in Chapter 4, the primary contribution of localised software in African languages is to increase the status of such languages rather than to provide increased access to ICT for their speakers. Once more information is available on the use of such software, its full potential in bridging the digital divide can be assessed. Although some research on the educational advantages of localised software exists, its application to the South African context would be interesting. This could include usage as well as development of such software; participation in localisation efforts such as translate@thons could have educational value.

Two separate but interrelated issues when talking about localised software in African languages are those of quality and standardisation. Because of the association of African languages with low-status domains and poor quality, it is particularly important that the localisation of ICT resources in such languages is of good quality. Only products of high standard can contribute to challenging the hegemony of English software in the ICT domain and help to increase access for speakers of other languages.

Different projects for localisation into African languages are not coordinated. This results in inconsistencies in the translations of terms. Being in its initial stages, the localisation process offers a unique possibility to research the development of a common standard. While localisation in African languages can partly take advantage of the experience of localisation in more powerful languages, it will necessarily have to adapt to the African context. The use of localised software in African languages in educational domains could contribute to the promotion of a common standard. Both aspects (i.e. quality and standardisation) need extensive research.

My statistical research and language attitudes survey could be replicated for other disciplines and include different groups of students. In terms of discipline, a comparison between subjects in the sciences and the humanities would be particularly interesting, given the difference between

discourses discussed in Chapter 4. Comparison of findings across different disciplines would contribute to a better understanding of the relationship between linguistic hegemony and access to discipline-specific academic discourse. The notion of "access paradox" (see Janks 2000) would be central to such a research, concerned with the balance between access and transformation.

Including different groups of students in a more comprehensive study by taking into account the performance and attitudes of speakers of Afrikaans and of foreign students, might yield interesting results. Such research would be particularly helpful in understanding the impact of home language and quality of previous education on academic performance and language attitudes.

IsiXhosa speakers at Rhodes emerged as a particularly interesting group, worthy of further research. A case study on this group of students could take into account, for example, socio economic and educational background, code-switching and use of their mother tongue on campus, attitudes towards speakers of other languages, etc. This would provide a comprehensive account of the experience of speakers of the most widely spoken African language on campus, and help to understand language dynamics at Rhodes.

The role of the Black middle class in initiating social change could be the topic of a very interesting sociological study. Research on the academic performance in CS and language attitudes of members of this group, discussed in the present study, yielded interesting and unexpected results. A broader understanding of the role and attitudes with respect to a number of issues of the emerging African middle class could give indications on the future trends in South African society. A thorough study on the actual size of the African middle class could challenge some myths, such as the belief in an imminent language shift of speakers of an African language towards English.

Finally, language proficiency of Black students in both English and their mother tongue needs to be researched. Such a study would of course need to take into account the differences between proficiency in the two languages, and should be based on a sound definition of what "being literate" means in languages with a different status and role. A dynamic study of how proficiency in English and the mother tongue of a Black student evolves throughout his or her study career could constitute an interesting study in Applied Linguistics.

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Appendix A: 2004 questionnaire

Respondents = 59

1) Gender:
Male *49%*
Female *51%*

2) Mother tongue(s):

English 10%	Afrikaans 0%
Xhosa 5*4%*	Sotho 10%
Zulu *10%*	Pedi 3%
Swati 4%	Tswana 12%
Ndebele 5%	Venda 0%
Tsonga 2%	Other

3) Which kind of area do you come from?
Urban (town/city) *44%*
Semi-urban (location) *34%*
Rural *22%*

4) Which kind of school did you go to?
English school *48%*
School in my mother tongue (i.e. Xhosa school) *52%*

5) Course:
CSc1B0 *41%*
CSc101 *59%*

6) Are you planning to study Computer Science also next year?
Yes *40%*
No *37%*
I am not sure yet *23%*

Comments
Computer Science for me is very difficult and the lectures don't seem to understand that. - I'm sorry to say but IT SUCKS!! - the course work is too difficult - BECAUSE I ONLY NEED IT AS A CREDIT - I just lost interest because of my lecturer. - I can't cope with the work. Unlike most computer science students, I didn't do computer science at high school. This is a major disadvantage for me. - Its more complex and my interests lie else where - IT'S NOT A REQUIREMENT FOR MY DEGREE - I will be continuing with information systems in my second year. - I'm not a computer person I only did csc101 for my credit - It is because I want to do something else. Not that I don't like it but I did not aim on doing it. - I'm not interested in computer, as long as I know how to click, type, save, copy and paste. - Because I am going to study journalism and media studies, so I want computer skills that are relevant to my course. - computer science is hard for me .First of all they are saying that its for anyone even if you didn't do computer literacy where as they only teaching as if you already new everything .Computer science needs someone who got a computer of her own so I don't

have it and I wont ever have as long I am still in tertiary. - It is complicated. - I find it to be very confusing - It's not part of the requirements for my career - I am only doing computer science because it is necessary for my course later and because I cannot carry on with it(Computer Science)as I have signed contract with an accounting firm already!

7) I think that, compared to the rest of my class, I am performing
Very well *9%*
Well *29%*
Average *50%*
Badly *9%*
Very badly *3%*

8) I speak and understand my mother tongue well
Strongly Agree *59%*
Agree *33%*
Don't know/ not sure 5%
Disagree *3%*
Strongly Disagree *0%*

9) I read and write well in my mother tongue
Strongly Agree *43%*
Agree *43%*
Don't know/ not sure *3%*
Disagree *9%*
Strongly Disagree *2%*

10) The deep variety of my mother tongue is very difficult
Strongly Agree *25%*
Agree *37%*
Don't know/ not sure *8%*
Disagree *17%*
Strongly Disagree *12%*

11) African languages should receive more support from the government
Strongly Agree *52%*
Agree *25%*
Don't know/ not sure *20%*
Disagree *2%*
Strongly Disagree *0%*

12) In order to use my mother tongue to teach Computer Science at university:
no improvement is necessary, my mother tongue as it is can be used to explain Computer Science. *7%*
it is impossible to discuss about Computer Science in my mother tongue *31%*
new technical terms should be developed in my mother tongue *40%*
English technical terms should be used *22%*

Comments
If we want to be compatible with other countries we cannot afford to be taught in an African language. English is a universal language which allows us to communicate with different cultures so it is best to carry on using it especially in a subject like Computer Science which brings together people who have different cultures and languages. It would also be a good opportunity for some of our brothers and sisters who speak

African language to learn English and understand it better. - I think it would be difficult to teach computer science in my mother tongue because of the words used. Maybe English technical terms should be explained first or developed in relation to the Tswana language. But otherwise it would be disastrous as some words would mean something else. - COMPUTER SCIENCE TEACHES YOU A LANGUAGE OF COMPUTERS AND I THINK THAT IT OK THAT WE ARE LEARNING THIS LANGUAGE THROUGH AN ENGLISH MEDIUM AND NOT ANOTHER. - Its quite difficult to use Xhosa when explaining anything computer based as all the terms refer to a certain thing and there is always a link between the thing referred to and the term, you always find your self using them. - It would be funny if computer science would be thought in my mother tongue. I think English is OK. - there is no need to use my mother tongue in teaching CS1B because that will make us not to improve in our English. - we should use English as we are used to it now or find an African language that can be used by all Africans e.g. Swahili; Zulu, Shona. We have a lot of indigenous languages. This will result in confusion if we don't get one African language. - I don't know about that because, there are some things that you can't translate into Xhosa, it would be very difficult to change to mother tongue lecturing. If it where to introduced let it be slowly and eventually with time it will be use full - But then somehow it will pose certain difficulties cause some of the computer technology will be hard to change to mother tongues. - My mother tongue is not that complex, in fact I think if we were given lectures on my mother tongue people would pass with flying colours. - Yes I strongly believe that new terms should be developed in my mother tongue or any other African language. Before English, it used to be Latin which ruled the world so one day it will be an African language.

13) My English is good enough to understand the Computer Science manual and notes
Strongly Agree *46%*
Agree *45%*
Don't know/ not sure *5%*
Disagree *2%*
Strongly Disagree *2%*

14) My English is good enough to follow lectures of Computer Science
Strongly Agree *51%*
Agree *42%*
Don't know/ not sure *4%*
Disagree *2%*
Strongly Disagree *2%*

15) The earlier children start using only English to learn in school, the better
Strongly Agree *46%*
Agree *19%*
Don't know/ not sure *5%*
Disagree *11%*
Strongly Disagree *19%*

16) Studying in English improves my English academic proficiency
Strongly Agree *66%*
Agree *17%*
Don't know/ not sure *14%*
Disagree *3%*
Strongly Disagree *0%*

17) Studying some things in my mother tongue would make me lazy and I would not learn enough English
Strongly Agree *26%*

Agree *16%*
Don't know/ not sure *16%*
Disagree *19%*
Strongly Disagree *24%*

18) If I learn something in my mother tongue, I will not be able to explain it in English
Strongly Agree *14%*
Agree *14%*
Don't know/ not sure *8%*
Disagree *42%*
Strongly Disagree *22%*

19) The best way to help students who are struggling because of language problems is:
to give them more English teaching *44%*
to use both English and their mother tongue to teach them *49%*
to provide them with support material in their mother tongue *17%*

Comments
University teaching is done in English, and I believe that if one has a lot of practise in English, one would be able to communicate in the language. It is possible to be fluent in speaking English and be very bad in writing it. SO the same applies to our mother tongue, speaking it does not mean that you can be good in writing it. Probably using both might help, but to certain extent. - Mixing the two languages make things easier for the non- English speakers. The reason why is that we remember things easier with our mother tongue. - Easier or layman terms should be developed to aid explanations. Diagrams would be of great help as well. - I believe that the course is at times too fast for some and maybe therefore should be done over a full academic year. - The government should realise that doing English second language wastes our time and money. All the schools should use English first language. This foundation thing is bad both socially and economically. - And a easy English and develop an easy terminology for non speaking English people - it is good to teach students (who are struggling with language), with both English and their mother tongue because their fluency will improve profoundly. - give them more English without disregarding their mother tongues.

20) Whenever the number of speakers of an African language in a course allows it, the University should consider offering two parallel courses: one in English and one in the African language
Strongly Agree *26%*
Agree *19%*
Don't know/ not sure *22%*
Disagree *19%*
Strongly Disagree *14%*

21) The University should produce support material in the mother tongue of the students to assist their learning
Strongly Agree *22%*
Agree *32%*
Don't know/ not sure *8%*
Disagree *25%*
Strongly Disagree *12%*

22) I think that to use some material in my mother tongue (together with the existing material in English) at University would be:
a good idea because... *58%*

a bad idea because... *42%*

Comments

I think that to use some material in my mother tongue (together with the existing material in English) at University would be: - In an institution like this, where there are many different African language speakers, it would be unwise to make the university provide material for all our different mother tongues. - It is not necessary. It is good to learn the proper English terms, that is why we are studying this course in the first place. - Some of the terms in Computer Science do not exist in the African languages. This could also be a disadvantage when doing job interviews. - For me personally, English is the easier to read and understand, even though it is not my mother tongue. I have grown up learning to read and write English only, unfortunately. - Even though understands their mother tongue very well, it is not that easy when it comes to academics. - There would have to be separate classes for different language users. It would create clashes with time-tables and in exams. - Like I've said before, some words might be having two/more meanings and some being insultive, which might not go well with some people. Otherwise Computer Science should be taught in English. If we were to use different languages, how are the programmes going to be written, will it be easy to write a programming language in Tswana, Zulu, Xhosa or so on, when its difficult as it is to do that in English? - The computer world is in English - Imagine what you would call the monitor (umabonamgama!). Motherboard (umama we-bhodi). It would be ridiculous!! - Learning in one's mother tongue is only essential in one's primary education as it facilitates faster learning and stimulates growth. In later stages of one's education one must focus on having the skills necessary to deal with the most number of people and situations, in which case English as a language and communication medium is best suited. - as it is it is quite difficult to speak my mother tongue and translation would take a lot of time. Also the need to be able to communicate with other people will not be option to learn computer science in my mother tongue. - some people are not proficient in English, but it cannot and should not be taken out of the teaching process. it is a universal language that will require you to learn it eventually so the best time is actually to do it while you are at varsity. to mix the two languages together may not be such a good idea as the terms in computer science are not available in African languages and to try to find abstract terms will eventually end up in confusion to both the teacher as well as the learner. the better thing to do is improve the learner’s proficiency in English in order for them to then understand concepts in computer science. - it would just confuse me and add to my course load - it would get confusion to try and fuse related ideas - BECAUSE THERE ARE TERMS THAT ARE IN ENGLISH THAT CANNOT BE TRANSLATED,PEOLPLE MUST JUST LEARN HOW TO SPEAK AND WRITE ENGLISH COZ MOST BOOKS R WRITTEN IN ENGLISH - students can't know how to write that thing in English. - student will be lazy to gather information on their own, plus this will not make them confident enough to express their knowledge to the world - most of the material used are in English and it would be expensive to change all of the material and it would be time consuming as well - English is the medium of communication. we can be able to communicate with each other using one language.(English) - how are we going to learn to use English if we've been taught in our own language, almost everything we do today is in English - because there are English words, that can't be translated to our mother tongues. - there are words in English that can not be explained in our mother tongue. That also will make things difficult for the university,as we South Africans have many different languages. - IT WOULD HELP THOSE WHO ARE VERY FLUENT IN ENGLISH TO UNDERSTAND THE CONCEPTS OF COMPUTER SCIENCE IN ENGLISH THROUGH THEIR MOTHER TOUNGE. FIRSTLY, MATERIAL SHOULD BE GIVEN TO THOSE THAT ARE DESPIRATELY NOT UNDERSTANDING ENGLISH. - computer language is difficult to understand and as a result people perform badly in the course.. in it bad enough that people cant understand computer language... - it would improve my mother tongue. - English is a barrier it would be a good idea to remove that barrier. More people may become illiterate due to introducing African languages in universities to teach concepts. - It would allow for easier translation of work and would be ideally suited to people who struggle to do anything in English. - IF U TEACH AN AFRICAN STUDENT IN ENGLISH HE IS FACED WITH 3 PROBLEMS.1st HE HAS TO UNDERSTAND THE WORDS THEN ANALYZE THE QUESTION AND THEN FIND AN ANSWER FOR THE QUESTION.WHILE THE WHITE STUDENT ONLY ANALYZES AND ANSWERS QUESTIONS. - It would provide a wide explanation of the same thing. - Not only will it make the student

understand more most of us come from twelve years of being taught in our mother tongues so it a bit of a struggle to adapt for a lot of students. - people will have a good knowledge of computer and they will have an advantage to know their work with out any assist from other students. - because people can easily understand something in their mother tongue and people are more comfortable in their mother tongue it will contribute to the indigenous languages not dying out - it will give a better understanding. - I will understand more,because sometimes I think I kn ow or I understand the meaning of some words even if I don't. - yes, because that will make you to understand your work. - not because. only if we find one African or SADEC language. - it will enhance my ability to study effectively,to understand the concept of the subject. - Cause not all of us understand things exactly,so this will help those that feel that they are not good English to cope well and maybe perform well as well. - I will understand better because if I didn't understand it in English I will just study my mother tongue try to translate what read to English the way I understand it - Well! If I had to teach it in university then I would have to be well prepared. So I would use the materials for my self, not for my students . - Students would then have a picture of what the English material mean and would save time. - I also think it is also a bad idea seeing that I might be seeing as incompetent, hence I will be stigmatised and feel discriminated. BUT, if I use both of these languages, esp. my home language, will allow me to grasp deeper meaning of those 'technical' terms. Again, who said African languages have no 'technical' terms. - because the stuff that I don't understand on the English material, I can look them up on the mother tongue material and at the end of the day I'll end up understanding the whole thing. - It's more easy to remember things when you have been taught in your mother tongue. It's unfair to complete with someone who is receiving knowledge in his mother tongue when you are receiving the same knowledge is other language. - it is not about competition, the two must be used together with understanding not just for the sake of using an African language. with more research, it can work so I agree. - I understand something better in my mother tongue than in English and vice-versa - Well that will be more appropriate to assist those individuals who may need help, we aren't all perfect to express ourself in English, it cause extra work to others, it's difficult to understand the Language sometimes - Because many students coming from schools in the townships are used to that form of teaching, so they will adapt to that style of teaching and therefore improve the understanding of that particular course. -

23) English is the language of:
the future *37%*
arrogance *5%*
tertiary education and university *47%*
freedom *19%*
national unity *52%*

Comments
Connection to the modern world - I'm not a South African so, I think you should be inclusive, because I feel some of the options above may apply to South Africa - most South Africans and the international community - whether English is a good or bad language is not the issue, rather the issue is that it is one of the most widely used languages and to try pin it down to something would be rather pointless. it is a functionality that we will have to use in order to improve global communications. ignorance will surely not get us anywhere. - BETTER COMMUNICATION BETWEEN TWO PEOPLE WHO COME FROM DIFFERENT PLACES. AT UNIVERSITY YOU MEET SO MANY DIFFERENT PEOPLE AND USING YOUR OWN LANGUAGE THAT ANOTHER PERSON DOESN'T UNDERSTAND CAN BE SEEN AS SIGN OF IGNORANCE AGAINST OTHER PEOPLE. - an international language - And Apartheid - TO SOME EXTENT YOU CAN SAY IT IS CONVENTIONAL - it depends on an individual, we should stop being ethnocentric and try to have one culture which will unite us all. language is nothing but a communication tool. - Financial prosperity and an important universal language. - English is not just a language, but it is a language that serves as a binding factor between African people who speak different languages. - English is a universal language and should be learned and understood by all. - the international language -

24) In which language are you more comfortable?

Comments
IT ALSO DEPENDS ON WHO YOU ARE SPEAKING TO. IF IT IS FAMILY THEN I NORMALLY CONVERSATE AND EXPRESS MYSELF IN MY MOTHER TONGUE BUT IF I AM WITH FRIENDS WE ARE NORMALLY SPEAKING ENGLISH BECAUSE WE ARE NOT FROM THE SAME ETHNIC GROUPS. BUT IF I DO FIND A FRIEND WHO SPEAKS SWATI AND ZULU, I TRY TO PUSH THE CONVERSATION TO THAT LANGUAGE. - IN CASES WHERE I AM COMFORTABLE WITH ENGLISH IT IS MAINLY BECAUSE ENGLISH WAS GIVEN TIME TO DEVELOP AS OPPOSSED TO AFRICAN LANGUAGES. So ENGLISH HAS MORE WORDS THAN AFRICAN LANGUAGES AND IS THUS MORE DESCRIPTIVE - I grew up in the streets so I am not good in any of the above mentioned languages. I am comfortable when mixing languages or using slang (mixture of all the languages that I can speak) -

25) If the University decided to produce support material in your mother tongue, which ones of the following kinds of material would you find useful?
None of these solutions *30%*
a glossary (a mini-dictionary of difficult English words with an explanation in my mother tongue *39%*
a summary of some parts of the manual in my mother tongue *28%*
audio-recorded additional lectures of Computer Science in my mother tongue *21%*
a translation of some parts of the help system of MS Windows and MS Office in my mother tongue *26%*
on-line solutions using my mother tongue *39%*

Comments
I think that I would be the wrong person to ask as the integration of the languages in computer science, I am sure would cause more confusion then it set out to make – all of the above are what will really happen. I don't have another suggestion, they are true completely true. - Audio is good idea for the initiation of learning Comp Science, then in time start converting the terms into the way required. - when I use my so called mother tongue things don't get in my had, it is hard for me to understand. - Maybe for once I should have a test conducted in my mother.

26) If the University starts producing support material in African languages, speakers of such languages:
will probably not use them *16%*
will have more problems continuing their studies *18%*
will not learn enough English *37%*
will have more problems finding a job *14%*
will be more interested in coming to this University *44%*
will have a better understanding of the topics they study: *26%*
will have a better understanding of the topics they study *0%*

Comments
I probably will not support it because if one was to find a job outside South Africa where Zulu or Xhosa is not spoken, how would that person communicate with the people? English is needed to communicate with the outside world, so if we don't practice speaking it, it becomes difficult for people to survive in this world. Using our mother tongue to give explanations is good, but we need to also consider that we want the people who are taught a particular course to be able to market themselves outside especially if jobs become saturated within our communities - and if they know their English very well they'll be able to translate the stuff they learned in English. -

27) To use support materials in my mother tongue:

would not help me *25%*
would confuse me *23%*
would help me get higher marks *30%*
would help me understand things better *46%*
would make me feel more confident *32%*

Comments
I am not sure if it will help me as I have never used it before. in addition, the atm uses the same system but I don't remember choosing Sotho or Zulu. - I don't know because some times I do feel like in my Mother tongue but it so difficult and complex I don't think I would understand some of the things that would be explained in the lectures, but all in all they should give it a try and see what happens -

28) Please type your comments here:
a little input on mother tongue will help but English should be used in lectures. it wont help if mother tongue is used in lecture because when it is time to work you will have to use English. - well, I enjoyed the test. but we cannot use our mother tongue in CS1B course as this will make us not to improve in our English. I want to improve my English, not that I can't speak I just want to gain more confident and to learn some more terms. English makes me to enjoy your university years and it helps me to make some new friends. - To learn computer in my mother tongue will improve my understanding. I will have a view of what I'm learning about and have more interest. But the text books of computer science are understandable if I'm reading them. - I think the whole thing is not about compromising and taking for granted my own mother tongue but to use it in certain areas where I feel that I do not understand what I'm being taught say for instance in English. The course material that will be in my mother tongue will help me understand things better and therefore self-confidence will be gained through this and definitely I think I'll that course with flying colours and if not "sky-rocketing" colours. - If both English and African languages can both be used to help us understand a subject content, then there would be more passes at the end of the day. - The thing with language, especially English, is that most African people were made to feel that it is better than they own languages. So if the same people think that there is no use of those language in the process of realising their inspirations then those languages run the risk of dying slowly and surely. But it is something like this that will arouse people's interest in African languages and their further development maybe even better terms that will be accommodated in science and technology. - I think English is not bad as a medium of teaching or interacting with other people. However I do think that our indigenous African languages need some recognition as well. And institutions like Rhodes have started doing that by providing a Xhosa course and this will help non Xhosa speaking people to be more tolerant as far as the language is concerned and also to have that determination to learn the language because it is what they will be questioned about on their course. - Everywhere we go people speak English and use it as a medium of communication. Even in the business world it is widely used and it would be more effective to use it at university level rather than our mother tongue, because varsity prepares us for the future and our lives ahead. I would much rather prefer to be taught, as well as receive lecture material, in English and my parents are inclined to agree. - I think that the course is fine in English. We did not come here to learn our mother tongues; we speak enough of it at home. Besides, learning Computer Science in my mother tongue will help one day when I am teaching an English person Computer skills. - I think the idea of using African languages in teaching is a good one, even though it does not affect me personally. Less people would be intimidated by the English used and so many would do well! - I think that using African languages would be good for some people. But for people who have always learnt in English, even if they are African, it would be unjust as it would confuse them. Some people grew up learning in English such that they can hardly make sense of what they read in their own languages. - I personally believe that English is the main language in the computer world, so it would only make sense to encourage students whom are not English speaking to try and use the English language in their studies of Computer Science. - the use of the mother tongue is very acceptable but not all the people will be able to do the work in the mother tongue and really it will be difficult for those who learn with their mother tongue to get the jobs cos English is the major language - although the idea may be a noble one I think that we have to consider both the long term as well as the short term effects of introducing the integration of African

languages at university levels. firstly the result would be the dumbing down of the actual course in order to make it understandable in a language which does not includes such concepts. the process would be long and I would think that in the long run it would not help the students because in the end they'd have to be proficient in the language when they do enter the business world. so instead would it not be more feasible to introduce a course that will help students be more proficient in English? - Well to some other student might be helpful to get extra support in their mother tongue. But I would say, this may perhaps make student to be lazy, more important one to lack confident. Education is not about getting degrees, but knowing your staff and be able to help the coming generation. - there is no reason for using other language. if mother language was used from the start, there would be better. now we can't adapt to that change. Learning in mother tongue is a bad idea, in fact it's too late for that. - I think if we can have this materials in high schools will make life better for us, I don't think we need them here in tertiary but it is a good idea for disadvantage student like me and others doing this course - making use of African languages can be a good idea but the problem will be that we as Africans will take an advantage of that and that will lead us not to find jobs. English in some other words is how we (all) south African communicate and if we don't know English we will suffer in many things, especially African people. to the point that says, it will be a good idea I mean, African also like white children will get higher mark and be brilliant as the majority of whites are. the reason why is that, they are taught in their mother tongue making things to be easier for them to understand. - I do not need additional material in my mother tongue because I speak and understand English as well as any first-language speaker. However, if the university were to introduce new material in my mother tongue, I would be glad to use it as it would help me to improve my mother tongue, which I feel has been crippled by my extensive use of English. - Mother tongue is great. However, the thing you should realise is that many people are speaking English on a much greater basis, and so even those people who are known to be predominantly "Non English" speakers essentially don't really know their language as much as they say they do. It is a sad situation, where one speaks English with another, knowing fully well that they have a common natural flowing language, rich in diversity, that they use on a decreasing basis. The government should intervene and encourage mother tongue education. The process, however, is way to costly, of translating books, hiring efficient educators in a language, and other variables - and it would take time to instil a culture which would accept this very quickly. - ENGLISH IS USED IN RSA MAINLY BECAUSE OF OPPRESSION.IF U GO OVERSEAS YOU WILL FIND THAT FRENCH,SPANISH AND CERTAIN OTHER LANGUGES ARE DOMINENT.NOW CONSIDERING THE CURRENT CHANGES IN POWER IN RSA.WHAT ENGLISH DID TO AFRICAN LANGUGES AFRICAN LANGUAGES WILL DO TO ENGLISH. ENGLISH DID NOT GIVE AFRICAN LANGUGES TIME TO DEVELOP (AFRICANS WERE DEPRIVED OF INTERNATIONAL DEVELOPMENT/DESCOVERIES) AND THUS COULDN'T GIVE NAMES TO THESE DESCOVERIES. ANOTHER POINT OF VIEW WOULD BE THAT ENLISH IS NOT SO DESCIPTIVE/BETTER THAN AFRICAN LANGUAGES.THE ARE CASES WERE ENGLISH IS NOT SO DECIPTIVE. eg. in Sotho paxama=lying down on bed in English there is no specific word for "lying down". English doesn't have a specific word for that, it merely explains the action. Since I am pointing the negatives of English here is one more. This one shows how illogical it is. con is the inverse of pro, now it would be logical to assume that congress is the inverse of progress but this is not the case. all in all English is not any better than the African languages it is used mainly as a result of oppression and convention. - This a good idea, I speak English on the average mark but knowing that there is a way for me to understand something I don't understand by looking it up in my own language would be a big bonus, it would also give me confidence as to not to pressure my self when I come across a word I do not understand. - I think your idea is good but African students will find difficulties to face up the situation because they will be embarrassed and they will think its discrimination but at the end of the day it will help us. If many people could consider your opinion I think they would approve your idea. anyway I wish you a good luck on your research. - a little input on mother tongue will help but English should be used in lectures. it wont help if mother tongue is used in lecture because when it is time to work you will have to use English. - well, I enjoyed the test. but we cannot use our mother tongue in CS1B course as this will make us not to improve in our English. I want to improve my English, not that I can't speak I just want to gain more confident and to learn some more terms. English makes me to enjoy your university years and it helps me to make some new friends. - To learn computer in my mother tongue will improve my understanding. I will have a view of what

I'm learning about and have more interest. But the text books of computer science are understandable if I'm reading them. - I think the whole thing is not about compromising and taking for granted my own mother tongue but to use it in certain areas where I feel that I do not understand what I'm being taught say for instance in English. The course material that will be in my mother tongue will help me understand things better and therefore self-confidence will be gained through this and definitely I think I'll that course with flying colours and if not "sky-rocketing" colours. - If both English and African languages can both be used to help us understand a subject content, then there would be more passes at the end of the day. - The thing with language, especially English, is that most African people were made to feel that it is better than they own languages. So if the same people think that there is no use of those language in the process of realising their inspirations then those languages run the risk of dying slowly and surely. But it is something like this that will arouse people's interest in African languages and their further development maybe even better terms that will be accommodated in science and technology. - I think English is not bad as a medium of teaching or interacting with other people. However I do think that our indigenous African languages need some recognition as well. And institutions like Rhodes have started doing that by providing a Xhosa course and this will help non Xhosa speaking people to be more tolerant as far as the language is concerned and also to have that determination to learn the language because it is what they will be questioned about on their course. - Everywhere we go people speak English and use it as a medium of communication. Even in the business world it is widely used and it would be more effective to use it at university level rather than our mother tongue, because varsity prepares us for the future and our lives ahead. I would much rather prefer to be taught, as well as receive lecture material, in English and

Appendix B: 2005a questionnaire

Respondents = 105

1) Gender:
Male *51%*
Female (49%)

2) Mother tongue(s):
English *13%*
Afrikaans *5%*
Xhosa *64%*
Zulu *13%*
Swati *4%*
Ndebele *2%*
Sotho *5%*
Pedi *3%*
Tswana *5%*
Venda *2%*
Tsonga *1%*

3) Which kind of area do you come from?
Urban/Town/City *32%*
Semi-urban/Township *43%*
Rural *25%*

Comments
COLOURED AREA HERE IN GRAHAMSTOWN. – Bulawayo, Zimbabwe - I was born in a small farm out of Grahamstown. In 1993 we came to Grahamstown. – Semi-urban - City

4) Which kind of school did you go to?
Mainly African school (i.e. in township or rural area) *62%*
Racially mixed school *38%*

Comments
ONLY TWO RACES NAMELY: BLACKS AND COLOURED`S! - I did not attend other kind of school. - African school in rural area - non - Mainly Chinese - African school. -

5) What was your first language in Matric?
An African language *57%*
English *40%*
Afrikaans *3%*

6) What experience did you have with computers before coming to University?
Little or no experience (i.e. only video games) *46%*
Basic literacy (i.e. using e-mail, Internet, word processing and spreadsheets) *42%*
Fully literate (including some programming) OR studied about computers in school *12%*

Comments

Did computer studies since grade10-12 - I was knowing nothing about computers. - had no experience at all, only saw computer but never knew how it operates. - MICROSOFT WORD AND HOW TO SAVE FILES AND ALL THE BASICS - not knowing the computer only seeing cashiers using them - non - Music uploading and Photo editing and so forth. -

7) Which year are you in?
1st year *82%*
2nd year *11%*
3rd year *5%*
Honours *1%*
Masters *1%*
PhD *1%*

8) Course:
Computer Skills for Commerce (BComF) or Humanities (BAF) *50%*
Computer Skills for Science (BScF) *21%*
Computer Literacy (All other) *7%*
Computer Science (BSc, BScHon, MSc, PhD) *22%*

9) Are you planning to study Computer Science also next year?
Yes *36%*
No *25%*
I am not sure yet *39%*

Comments
Because I am not interested in computers. - N/A - cause I do not like computers. - THE DEAN OF SCIENCE IS TEACHING US NOW AND HE WANTS US TO FAIL BECAUSE HE DOES A LOT OF SPOTS TEST(WHICH ARE HARD) IN WHICH IF YOU MISS TWO OF THEM OR YOU FAIL THEM YOUR DP IS GONE.ALSO THE SECTION HE IS TEACHING US IS HARD, THERE IS NOW A DP AND OUR TUTOR ARE NOT HELPFUL. - It's not my major. I'm just doing it to make up four courses. - I'M LOOKING FORWARD TO DO BIOLOGICAL SCIENCES - My future plans don't involve computer science as I'm not planning to be a programmer or anything like that. I find the course extremely challenging and I don't have a valid reason to put myself under such pressure. - I'm not enjoying it all that much -

10) I speak and understand my mother tongue well
Strongly Agree *58%*
Agree *33%*
Don't know/ not sure *4%*
Disagree *5%*
Strongly Disagree *0%*

11) I read and write well in my mother tongue
Strongly Agree *44%*
Agree *42%*
Don't know/ not sure *4%*
Disagree *7%*
Strongly Disagree *3%*

12) The deep variety of my mother tongue is very difficult
Strongly Agree *12%*
Agree *33%*

Don't know/ not sure *13%*
Disagree *28%*
Strongly Disagree *15%*

13) African languages should receive more support from the government
Strongly Agree *8%*
Agree *26%*
Don't know/ not sure *31%*
Disagree *22%*
Strongly Disagree *13%*

14) In order to use my mother tongue to teach Computer Science at university:
Yes *34%*
No *35%*
I am not sure *31%*

15) Computer terms in English can be used when speaking about computers in my mother tongue
Strongly Agree *8%*
Agree *32%*
Don't know/ not sure *37%*
Disagree *16%*
Strongly Disagree *8%*

16) Are you familiar with open source software (Linux, OpenOffice, Mozilla, Google) in the African languages?
I have used it before *15%*
I know it exists but I have never tried *27%*
I have never heard about it *58%*

17) How do you feel about using English at University?
It is good to use English as a common language for our own sake, it will be useless if a person has got a degree in his /her mother tongue whereas Her/She expect to work in a big successful company where different people are working there, for example white people, Indian people, including foreigners. And in fact here at Rhodes/other University we came from different places and for us to communicate or to hear each other well we have to use English. - For me English is much easier to understand, because for 90% of my academic life I haven taught in the language. - its cool, since this is an international varsity and all, - To me it is quite fine cause we speak different languages so in order for us to understand each other we must use English cause it is the medium of instruction. - don't have a problem cos it's a universal language, its always nice to be fluent in other languages other than your mother tongue. - I'm OK with it - using English in university is good because it gives the opportunity to communicate with other African language speaking people whom I do not understand their language. Not only should it be remembered that English is a language used world wide, so if I went to an African university I would not be considered in other countries even if I'm well educated and qualify for whatever is needed. For example I would not be considered in Cape Town because I would have graduated in Mpumalanga where there we used SiSwati in all that we learned, and in Cape Town they use Xhosa, which actually would mean they want a Xhosa graduate and not any other. - FIRSTLY, THE FACT THAT I DID NOT USE ENGLISH AS A FIRST LANGUAGE AT SCHOOL, COMPLICATES MY STUDIES, BECAUSE ADAPTING TO THE MY NEW MEDIUM OF INSTRUCTION, ENGLISH, WILL TAKE TIME. ON THE SAME NOTE, IT`S NOT A THING THAT CAN HAPPEN OVER NIGHT. NEXT, I FEEL THAT USING ENGLISH HERE AT UNIVERSITY IS NOT ONLY A GOOD THING, BUT THE FACT THAT OUT THERE IN THE REAL WORLD ENGLISH IS THE MAIN OFFICIAL LANGAGE OF COMMUNICATION. WITHOUT ENGLISH, YOU`LL MOST

DEFINITELY FEEL LOST.SIMILARLY, USING ENGLISH HERE AT RHODES TO ME, DOES NOT ONLY EXTEND MY VOCABULARY, BUT ALSO GIVES ME CONFIDENCE IN COMMUNICATING EFFECTIVELY. - so far it's the best way of learning because we live in a very multilingual world so it's better to have a medium of learning which is English! - I do not see problems using English at University. Maybe I am used to it. - I don't have no problem using it in lectures but outside lectures I feel like it's being excessively used. - IT IS NOT THAT MUCH OF A BIG DEAL, JUST ANOTHER LANGUAGE YOU LEARN! - Well the first thing I can tell you is that, using a computer at university is much more satisfying I mean you feel the importance in other words that is what I have been dreaming to be in a university and do all those titillating titbits about English - Its better coz there's a diversity in languages and English is common to all so it makes communicating so much better. It would really suck if we all had to speak our languages coz we'd be constantly interpreting to those who don't speak our language. I think its better this way; all speaking one common language - I THINK IT IS THE BEST LANGUAGE TO BE USED BECAUSE IT PREPARES US FOR THE BUSINESS WORLD GLOBALLY, AND IT IS REGARDED AS THE LANGUAGE THAT BINDS PEOPLE FROM DIFFERENT CULTURAL GROUPS. - I think its great so that we can all be accommodated well and so that we can communicate well with the foreign students without any difficulty of not understanding each other. - for me English is good medium of communication therefore it is easier to understand the work we are given and tasks we have to do. but for other people its more difficult because of their background which English wasn't taught as a 1st language - It is fine cause we speak different languages so English makes it easy for us to communicate with one another. - even though I think we have to use it,I think it can be boring sometimes. - Using English at university it's a nice thing because if you ask me in most university we have foreigners, and when they are communicating with us (South Africans) they use English. - I feel good because English is used everywhere around the world. - I think it's good to use English at university because it is a national language [language of communication all over],so it is a must that it is used as there are many different students who came from different places. - That's all I know actually know since my primary days. It would be nice if it could be different but I guess at this stage it has become almost like the only sensible thing. Ndebele would truly be beautiful to have during lessons. - since I am coming from the school which does not speak English as the main language and a means of communication so I strongly I agree that English should be used as a language of teaching, learning and communicating. - It's not really a big deal, I'm cool with it and with different races at university it's really okay for me - I feel that sometimes I can express myself more clearly using my mother tongue but I am not given that chance here. - FOR ME ITS OKEY BECAUSE I HAVE BEEN THOUGHT IN ENGLISH SINCE PRE-SCHOOL UP TO MATRIC.ANOTHER THING ENGLISH IS A WELL KNOW LANGUAGE AROUND THE WORLD THEREFORE IT WOULD BE EASY TO COMMUNICATE WITH OTHER PEOPLE FROM DIFFERENT COUNTRIES.IT WILL ALSO BE EASY TO GET A JOB IN OTHER COUNTRIES BECAUSE U DONT HAVE TO START ALL OVER AGAIN AND LEARN THEIR LANGUAGE BECAUSE IT IS MOST LIKELY BE THAT THOSE PEOPLE YOU WILL BE WORKING WITH OR FOR WILL UNDERSTAND ENGLISH. - I feel it very appropriate as it is a well recognised language of communication globally. One has to learn how to master the language as it has many advantages. - I have no problem with it because I have used it as a common means of communication all my life so I'm quite used to it now. - I think it is difficult but its for the best. - It is the medium of instructions in almost every part of the world, so it make it easy for everyone to easily interact with one another. But I think, it makes it easy to communicate, I think African languages deserve their platform also, even if it's so minimised. At the end of the day, there are people just relax and don't learn any African language, whilst we have to struggle for learning to communicate in English. Somehow it's so unfair to us. - challenging as I had to write but think in a different language. - It's a good thing that we use English. as it's the most important language to know when entering into the work place. - I really like because after finishing my studies I will have to work in a that will be using English as the main language. - I THINK THAT IT IS OKAY BUT THERE SHOULD BE SOME KIND OF HELP FOR THE KIDS WHO COME FROM RURAL SCHOOLS BECAUSE THEY MAY NOT UNDERSTAND THE LANGUAGE WHICH MIGHT LEAD TO THEIR FAILURE WHEREAS IF THERE WAS SOMEONE TO EXPLAIN IT TO THEM IN THEIR MOTHER TONGUE THEY WOULD UNDERSTAND IT MORE CLEARLY AND NOT FAIL - no problem - EXCELLENT - I'm not sure, I got used to speaking the language all the time, but I think that the main people

that actually encounter a problem speaking English all the time are 1st-years 'coz they are not used to the idea yet!!! - English is very vital in university. It is also an official language so it must be used in university to improve the skill for those who did it at second language. - I don't feel quite comfortable because I have to speak English no matter what, because we are coming from different places speaking different languages so English is the only language of communication. - English is a relatively easy language but I don't think I should be forced to speak English at all times. I do however understand why I need be fluent and have a good command of the language since it is a global language that people use and if I want to succeed in other countries I would have to be able to speak. But however I don't like the general perception that African languages are the inferior and rather uncivil languages. I love my mother tongue and I would appreciate it if students would stop abandoning their languages just to look cool since somehow it has been decided that English is better than other languages. I don't believe that just because u speak English that necessarily means you are better or smarter than others. Since when is English a measure of some one's intelligence, wisdom and status. - As I am the person from township schools , I feel difficulties in speaking English. But because I like it I try by all means to learn it. - I think it is the only way forward because it is used world wide and the only way to keep the standards of the university is to use it. On the other hand I guess I can afford to say this because I went to an English private school. I have friends though who went to black schools and still struggle with English. Therefore whilst I think that English is should be the main language used in varsity, there should be perhaps extra literacy classes for students who come from previously disadvantaged schools that aren't part of the BComm foundation course. - I feel good, because it's the only language I can use to communicate with other people who speak other languages. - Its good because you get better at a different (world related) language. and you can communicate with everyone around you who are from different backgrounds. - it is the language used so I have no beef with it coz I can UNDERSTAND IT - I don't really mind because I went to an English school all my life I can't really say it affects me to much. - It is a language spoken world-wide and with the existence of foreign students in our varsities is the most logical thing to do. - I feel good although I don't have confidence to speak it. It is the only way I can learn it. - I feel great because I do not have problem with English - I am comfortable with using English at University because it is a language that allows me to interact with people from various cultural backgrounds. More importantly the use of English helps in minimising segregation that would result among the various cultures if we were to use our mother tongues for learning at University. - well I think it is a privilege using the language, after all it's still the most commonly used language in the whole wide world. so I don't think it is a burden or something rather than a privilege - English has to be at University because it connects us as we come from different countries and provinces, and of different race - its good cause it improves my language skills - Its a good way of doing things. English is a central meeting point in Languages in S.A and I think that learning in English means we can all communicate with each other clearly than doing so in lots of other different languages. - it's good because I learn something that I don't know in English. - It's superb I really like it because English must be improved at tertiary and it has to be spoken because we meet people from many different countries speaking different languages so English is the best language which we can use to communicate with those people and this helps even when you go to other countries. - Used to it. - I think its fine because by using it is possible to understand each other - it is a cool thing cause we are such a multi-racial students so English makes it easier to communicate with whom ever you want to talk to - I don't have any problem in being taught in an English medium - English is fine its like a middle ground of communication at varsity because of the diversity of cultures. - using English at rhodes is very strange to me because at my school we were using xhosa almost in all languages .but at this term I'm enjoying it a lot and I don't want it to be stoped , in other word I feel happy with using English . - Using English at University I think is a very crucial thing in my life,I really feel pleased because English is the only best key for one to get a job. - it is essential for the business world - IT IS GOOD BECAUSE FOR EXAMPLE VERY TEXTBOOK THAT WE USE IS WRITTEN IN ENGLISH - I have attended the same school for over 8 years and there the main language was English, so using English as the language for my education feels natural to me. - It's quite a good thing because at school I was not that exposed in speaking English that much although even now I haven't spoken much. To be true it is quite a difficult thing but I'm trying. - I'm cool with it cos I've been subjected to speaking English all my life, even when I speak to my mother - I feel there is a need for it because English is a language of technology and it is therefore essential in the job

market. It should stay being a medium of instruction at tertiary level and people should start accepting it. - I think its fine because we have had English as a medium of instruction at high school level so I don't have any dispute with the fact that English is being used at tertiary - Its very reasonable, it would be impossible to have lecturers teaching in all 11 official languages. They would actually have to learn other African languages to accommodate all the other students which come from Zimbabwe, Zambia, Botswana, Namibia etc. - I don't mind because it is the world widely used and most people communicate in English regardless of what country or national group they belong to. - It is fine because it is an international language which gives me opportunity to communicate globally. - great - It helps, because one gets very familiar with the language, because it is the language that's used in the corporate world, and you can communicate with everyone else. - I've been using English as a medium of communication in my learning career so I'm used to the concept of speaking the language at any learning institution. So English use for me is very convenient. - I feel it is a good idea to allow everyone to communicate and comprehend each other. - It is good because when I complete my degree I don't know whether I am going to work with the Tsonga speaking people, so it help to improve my English and I can communicate very well with other people who are speaking different from me. the disadvantage of using Tsonga at a university is that I cant speak English very well - It's very difficult but I'm going to lean them as the time goes on - It is difficult for me as it is my second language, but it helps me cope with my studies very well. - I feel very good about it because it makes you understand and be able to learn new things,not that you cant have knowledge of things when you speak your mother tongue. With English you explore a new world of better communication and better understanding,well that's my view. For me when I came here @ Rhodes I was a bit intimidated because was speaking so beautifully and I could not because I was from an African school but then I got mixed with white friend and I am speaking beautifully as well . - its a new thing to be explored in such deep English,but I am trying learn fast. - It feels good because my English usage skills are growing day-by-day. - I just feel that it is fine, after all we are not the first to be taught in English. It has been there, we have to live with it. As they say English is the Universal language. - For me, African languages is an advantage due the fact that I have experienced that 'I can type much faster when using English. Moreover, due to the fact that there is a diversity of ethnic at University, everybody is comfortable when approached in English because English is a Universal language. - No big deal for me. - English IS -

18) My English is good enough to follow lectures of Computer Science
Strongly Agree *6%*
Agree *7%*
Don't know/ not sure *4%*
Disagree *52%*
Strongly Disagree *31%*

19) My English is good enough to understand the Computer Science manual and notes
Strongly Agree *3%*
Agree *5%*
Don't know/ not sure *33%*
Disagree *41%*
Strongly Disagree *17%*

20) Sometimes, in English, I think I understand what something means even if I don't
Always *2%*
Often *13%*
Sometimes *54%*
Rarely/ almost never *28%*
Never *3%*

21) Studying in English improves my English academic proficiency

Strongly Agree *59%*
Agree *33%*
Don't know/ not sure *5%*
Disagree *1%*
Strongly Disagree *1%*

22) Studying some things in my mother tongue would make me lazy and I would not learn enough English
Strongly Agree *13%*
Agree *34%*
Don't know/ not sure *21%*
Disagree *25%*
Strongly Disagree *7%*

23) If I learn something in my mother tongue, I will not be able to explain it in English
Strongly Agree *6%*
Agree *18%*
Don't know/ not sure *17%*
Disagree *47%*
Strongly Disagree *12%*

24) I understand things better in...
English *14%*
Either English or my mother tongue, it is the same for me *72%*
My mother tongue 14%

25) It is easier to remember something if I hear it in...
English *12%*
Either English or my mother tongue, it is the same for me *68%*
My mother tongue *20%*

26) Main problem with Computer Science
following explanations *16%*
the terms/difficult words used *22%*
understanding what you are supposed to do *43%*
no problem at all *19%*

27) The best way to help students who are struggling because of language problems is:
to give them more English teaching *46%*
to use both English and their mother tongue to teach them *40%*
to provide them with support material in their mother tongue *14%*

28) The University should produce support material in the mother tongue of the students to assist their learning
Strongly Agree *11%*
Agree *39%*
Don't know/ not sure *26%*
Disagree *17%*
Strongly Disagree *7%*

29) I think that to use some material in my mother tongue (together with the existing material in English) at University would be:

a good idea because... *54%*

a bad idea because... *46%*

Because it wil be easier for me to learn Computer science well,and to capture things in a faster way. - It would be a good idea in institutions that a predominately African.In case of Rhodes i think it might add more confusion when the afican students discuss some of their problems fellow stundents - for me it would be useless, and wouldnt like this in my lectures, or my notes, but i suppose for the less previlaged - It would be bad cause the are students who do not speak the same language as I. - chinese ppl are top notch in technology but they can't speak fluent english, so why not teach africans in the language the understand better, probably that will help improve our technological capabilities. - My mother tounge is sometimes very complicated and ambiguous it would be very difficult to translate scientific terms into my mother tounge - would not make sense at allllllllll!!!!!!!!!! and it would mean i have to focus on two languages at the same time. - THE FACT THAT THESE STUDENTS WILL HAVE TO WRITE THEIR EXAMS IN ENGLISH, IS BOTH ADVANTAGABLE AND DISADVANTAGEBLE. MY REASON FOR SAYING SO, IS BECAUSE IT DOES HELP THEM TO UNDERSTAND THEIR COURSES BETTER, BUT IN THE END OF THE DAY, THEY CAN`T EXPRESS THEMSELVES FULLY IN THE MEDIUM OF INSTRUCTION, WHICH IS OBVIOUSLY ENGLISH AND NOT THEIR MOTHER-TONGUE. - because then i wouldn't see the point in learning english if i have things readily supplied in my mother tongue! - I think it will be the waste of time and money,because of the material that must be bought - it would be easier to understand for those with an african mother tongue - PEOPLE WILL BE HAPPY AND GIVEN A CHANCE TO LEARN MORE ABOUT THE COMPUTER! - I will not feel that I'm in University and it will affect my positive attidute towards my studies - for those who were not really exposed to english in high school,they will benefit the most. - SOMEHOW IT WILL CONFUSE STUDENTS. - During your teaching you will confuse your students and is often hard to translate African language to English. - because some student didn't do english as a 1st language at school therefore they need more support by offering material in their own mother-tongue.but at the same time people come from different places & speak different languages & it would take some time to get expects & put study materials together would be a great hassle! - cause it will be expensive. - becase as i said i could'nt even interprete the computer science related word in xhosa - For in case there are people who doesn't understand other languages - Computer Scienc is a new invention, some words can not be translated into English. - We are here to learn ,so if we use both we can catch up more. - for many it will be more understandable, less foreign and quite fascinating - in a world we live in English is used as means of commmunicating globally. - Because some things like expansions cards,tower and others I don't have a clue how they would be translated also network and Internet/www/a browser/search engine unless a good translator could be found. - in this way i would unerstand more and improve my marks. - Some students from disadvantaged schools will have difficulty understanding some Enlish words and terms. - it does not help teaching people in their mother tongue because at the end of the day tests and exams are going to be in english so it is going to it more difficult to them to have to translate the work when they write a test. - cause every thing is done in computers in our days. - Those who strugled to undestand their work will easily go through them when they are in their mother tongue. - - After all you'll have to use English in the work place. - I WOULD UNDERSTAND MY TASKS MORE EASILY - it would help those who are struggling with english. - SO THAT YOU CAN BE ABLE TO TELL SOMEONE WHO CAN NOT UNDERSTAND ENGLISH - this way i'lll get to understand things easly!!! - Because students will just concentrate on the ones with their mother tongue and they won`t get enough english teaching. - - People who do not undersand English will be able to uderstand the insructions by looking in their language. - even though I can speak and understand English well, I sometimes struggle to understand some of the terms and instructions. - there are no computer terms in my mother tongue and it will need lots of money from the university. - not all of us are that good when it comes to our mother tongue, like when i was in matric last year my venda teacher used to say i don't speak the right venda and he had to explain almost everyword he used but in my english class that wasn't really necessary. - BECAUSE IT WOULD CLARIFY SOME OF THE TERMS - Some people prefer learning in their mother tongue and seeing as that South Africa is a multi linguial country everyone should have a fair chance to excel and if studing in their mother tongue is the way then big ups to that however this

could cause a problem with the foreign students because to them it might seem discrimatory which would cause problems. - - This could result in someone having no drive to improve their english because they can learn in their native tongue. This would be detrimental to that person's skills in interacting with people from various denominations of life because their english standards would be relatively low - for people who are strugling with english - It will help to explain some of the things better It will improve our passing mark - i guess for those who don't understand to get it. But id rather english right through because i understand it more than my mother tongue. - because it'll be easy for me two know the com sci - There are computer terms in english that do not exist in our languages and there is no guarantee that all students in that class speak the same language. - it would help put things in perspective - there are terms you cannot translate to african language. - This is a difficult one. It would be easier if everyone learns English before coming to varsity. - becouse you can be a computer science student with a degree and when you go for a work where you will be required to use english in all the terms of computer science .there 11 african languages , that means more money will be needed . - one would be interested in mother tongue written and don't bother about the one written in english. - is this really necessary - IT WOULD BE EASIER TO UNDERSTAND AND TO TRANSLATE EVERYTHING BACK TO ENGLISH - If people get too attached to thier mother tounge and refuse to learn more english they are going to struggle when they join the work force. - So as to understand better and be able to give difine consept in both languages. - for those people who didn't do the english language in high school as their first language, it would be quite a good idea - iam not quite sure about that because as i have said that maybe my mother tongue will make things more difficult for other people not trully africans - too much hassles - i dont think there will be enough lecturers for each subjects. - There will be no enough terms for some of the terminologies in the course - They will not be able to expalain it i english - give the people who are not comfortable with english a better understanding of the course - It helps because you can understand things alot better. - People may become so relaxed and dependant on using their mother tongue that they can't apply their knowledge when they have to use it in English terms.University to me is place where people have to learn to be independant and if that idea can be implemented,why don't we all go back to primary school where one is spoon fed - it would make com sci harder to understand since most people and the media use English computer terms. - because will not forget our roots or where we are coming from and it is good as it will be promoting both languages - Not all of our english literature skills are developed to the same level, and it can help if you have both languages to learn from. - - because we won't be able to get jobs in other countries if we only understand things in our mother tongue - to be well sure that you are on the right track . - It would give students who do not know English fairly well an excellent chance to catch up with other students who know English - It will provide a good understanding of what somebody had not understood very well in English - - because it will definitely level the playing field between those who speak english and the others. -

30) The main problem with usign African language to teach Computer Science is that...

There are no computer terms in my mother tongue *67%*
Students who do not speak my mother tongue might have a problem with that *66%*
It would be too expensive to create new material in my mother tongue *55%*
I would not learn enough English *46%*
Manuals and handouts in my mother tongue would be difficult to understand *45%*
There are no lecturers who are able to teach about computers in my mother tongue *36%*
It would not be a problem *7%*

31) If the University decided to produce support material in your mother tongue, which ones of the following kinds of material would you find useful?

A glossary (a mini-dictionary) of difficult English words with an explanation in my mother tongue *44%*
Audio-recorded (spoken) explanations in my mother tongue *36%*
Manuals,/ handouts written in my mother tongue *18%*

A version in my mother tongue of the things we are learning about (i.e. the Windows OS, MS Word, Excel, PowerPoint etc and Internet Explorer) to practice *30%*
None of these solutions *30%*

32) If the University starts producing support material in African languages, speakers of such languages:
Will be more interested in studying about computers *47%*
Will have more problems when they find a job *44%*
Will be more interested in coming to this University *30%*
Will probably not use it *27%*
Will have more problems continuing their studies *26%*

33) To use support materials in my mother tongue:
Would confuse me *38%*
Would help me understand things better *28%*
Would not help me *32%*
Would help me get higher marks *19%*
It is too late for me, I would have needed it before *41%*

34) Please type your comments here:
It is a right way to give student chance to express their opinions towards this English thing used in the university,but according to me there is nothing to be done to invent our mother tongue in institutions. English will help us more in our futures. - I think the use of English in higher education is problem for African students who come from black school,I strongly support a project of this nature as long as is not at the expense of other students. - in my case, don't do it – I think that we should stick to the system that we are using right now cause it is the best one for all of us. - lets improve our understanding of technology by making manual in African language, to me that would be great. - It would have been useful if I were taught maths and science in primary school in my mother tongue. Because most of the stuff in computer science is based on mathematics and science, starting to teach me in my mother tongue at university is useless it should start at grass root level. I'm all for teaching in African languages but it should be done from the very beginning - Adding African languages in university simply means a separation and obviously the campus would have to be way bigger than it is right now. IF COM.SCIE alone is in an African language then I would need a computer that is in my African language and that might be a problem for foreign brands that are for example in the states, it means they would also have to know my African language to manufacture a computer in my African language. it is even difficult to express this because of the confusion it might cause. - IN CONCLUSION I FEEL THAT PROMOTING THE USE OF MOTHER-TONGUE AT UNIVERSITY IS NOT A GOOD IDEA. IT MIGHT HELP STUDENTS IMPROVING THEIR UNDERSTANDING IN THEIR COURSES, BUT THE FACT IS THAT THEY WILL NOT EXPRESS THEMSELVES EFFECTIVELY IN EXAMS. AT THE END OF THE DAY THEY WILL BE CONFUSED, AS THEY HAVE TO DEAL WITH TWO LANGUAGES AT THE SAME TIME . ANOTHER CONSTRAINT WILL INCLUDE THE COSTS OF RESOURCES AND LABOUR- STAFF TO TEACH THE SUBJECT. ALL THESE WILL TAKE TIME AS THEIR ALSO NEEDS TERMINOLOGY THAT HAVE TO BE DEVELOPED AND WORKED AT. - I think I've written all that I need to say earlier in this quiz - No comments - I think more should be done to develop African languages in higher education. it shouldn't be dominated by a single language as it is at the moment, dominated by English. - ADDING SOME COMPUTER THINGS IN DIFFERENT MOTHER TONGUES WILL BE USEFUL FOR OTHER PEOPLE! - It will confuse me because I have mention it earlier that I'm not that can of person who communicate good at both languages, English will be today for me, I passed my mother tongue with 50% that is a lower marks, what I'm trying to emphasis is that it will not worth. - Maybe having additional books in our mother tongue would help maybe not coz then how will it be decided which languages will be used and what if the chosen language is not understood by a minority,will more books be written in the minority's

language?This could be very expensive and since it has no guarantees it might be a big flop. Also sometimes it difficult and takes long to read a book written in your mother tongue and this discourages the reader(me) when I take too long to grasp a simple line,whereas in English I can grasp it easily. - I THINK THE WAY THAT THINGS ARE DONE CURRENTLY IS GOOD AND IT MUST NOT BE CHANGED AT ALL. - I think as an African this would not work out for me because in future in the workplace I will not be considered as qualified as others did computer science in English. - I think that for some computer programs it would more difficult to be programmed in African languages because its gonna be expensive - We must use English cause it is the best way to communicate. - no comments - I have no comments. - this needs to be initiated at an earlier stage in life. Say like in primary. This is the stage in which students are introduced to computers and are taught the terms. - no comments - it might be a good idea for people who are struggling to understand English for them to have additional handouts in their mother tongue otherwise it is out of the question to want to teach it in their home language and besides it will put a lot of work and pressure on lectures because of the 11 official languages plus the other foreign students we have at our universities. - I THINK IT WOULD BE A GOOD IDEA FOR COMPUTER MATERIAL TO ALSO BE USED IN THE MOTHER TONGUE SO THAT THE NUMBERS OF COMPUTER PUPILS COULD INCREASE INSTEAD OF DECREASING - Computer Science is good the way it is done now. If we can include African languages in it, level of English will go down immediately. it is too late now to implement things in African languages because most of people are interested in English not their languages. - I think that its great that the university is thinking about helping the students who are not comfortable in speaking in English so this would be an excellent idea so as to get more black people interested in computers. - it is too late to think about implementation of African languages,let us rather continue with what we were made to believe is the way to go which is English cause today everything is about technology which requires English. - I THINK IS TO DREAM WHEN I WANT TO LEARN COMPUTER SCIENCE ON MY TONGUE BECAUSE THERE ARE LESS THAN 15 TSONGA SPEAKING PEOLE IN GHAHAMTOWN OR RHODES AND 80% OF THEM ARE FIRST YEARS.I THINK THAT YOU MUST TRAIN ALL PEOPLE FOR FUTURE THAT WILL BE A GOOD PLAN -

35) Please leave your contact details (phone nr, email address) if you want to be contacted for an interview on this topic. n = 38

36) At a later stage, we might need some students to be involved with the development of multilingual material in English and the African languages. Please leave your details if you think you might be n = 31

Appendix C: 2005b questionnaire

Respondents = 163

1) Gender:
Male *54%*
Female *46%*

2) Mother tongue(s):
English *65%*
Afrikaans *5%*
An African language which is also spoken in South Africa (e.g. Sotho, Swati, Ndebele) *4%*
Another African language (e.g. Shona, Swahili etc) *16%*

3) Which kind of area do you come from?
Urban (town/city) *65%*
Semi-urban (location) *35%*

4) What experience did you have with computers before coming to University?
Little or no experience (i.e. only video games) *8%*
Basic literacy (i.e. using e-mail, Internet and word processing/ spreadsheet) *54%*
Fully literate (including some programming) OR studied about computers in school *38%*

5) Which year are you in?
1st year *44%*
2nd year *21%*
3rd year *23%*
Honours *6%*
Masters *5%*
PhD *1%*

6) Course:
Computer Literacy *15%*
Computer Science *85%*

7) Have you ever been a tutor/lecturer OR are your tutoring/lecturing at the moment?
Yes *20%*
No *80%*

8) Are you planning to study Computer Science also next year?
Yes *34%*
No *35%*
I am not sure yet *31%*

9) My English is good enough to follow lectures of Computer Science
Strongly Agree *4%*
Agree *10%*
Don't know not sure *11%*
Disagree *53%*
Strongly Disagree *22%*

10) My English is good enough to understand the Computer Science manual and notes
Strongly Agree *0%*
Agree *10%*
Don't know/ not sure *17%*
Disagree *54%*
Strongly Disagree *19%*

11) Sometimes, in English, I think I understand what something means even if I don't
Often *4%*
Sometimes *23%*
Rarely/ almost never *57%*
Never *16%*

12) main problem with Computer Science
following explanations *11%*
the terms/difficult words used *13%*
understanding what you are supposed to do *44%*
no problem at all *31%*

Comments
Not to say that it is easy but if you try and read something with understanding it is usually not difficult to grasp.-And learning to think in an algorithmic way. As a tutor I can see that my tutlings struggle to think in terms of algorithms - logically like a computer would, they think like people do.- implementing theory to practical. -Problem solving. I don't really understand it that well.-A basic understanding of what the course is all about----Most of the time it is during practicals, because sometimes especially when you are computer illiterate, then you really like a "cabbage" not knowing what to do. During lectures some of the terms being used are a bit vague. sometimes the tutors don't assist or are selective in who they help and don't really explain but just give the answer to you English is not my first language I have problems hearing what is said mostly its too fast Sometimes it is difficult putting into practice what was covered in theory. don't understand databases, lecturer went through the course way too fast for someone who has never touched that program before!!! Sometimes the lecturers don't express what they want in the correct manner, or what they are asking for and what they actually want is different. Sometimes the questions can be a bit ambiguous. except for the vagueness in some questions, particularly IS-related questions. THE PRACS, IT'S HARD TO APPLY WHAT WE LEARN IN CLASS. none

13) African languages should receive more support from the government
Strongly Agree *5%*
Agree *17%*
Don't know/ not sure *31%*
Disagree *28%*
Strongly Disagree *18%*

14) In order to use my mother tongue to teach Computer Science at university:
Yes *17%*

No *59%*
I am not sure *24%*

Comments

It's an interesting question...saying 'invent' seems a bit unrealistic, surely language just evolves if necessary?-because you will just derive them from English, even creating more workload on students. Mind you in order to learn a new word you might need to know it root. eg in English we are always referring Latin, Greek roots. etc. People should concentrate on learn-Computer Science is aimed toward educating students to participate in a fast changing international world of Computers. Internationally the language of Computers is English, to invent new terms would confuse the issues-Many African languages seem to take the English and Africanise them. I don't if that is good or bad, but it generally results in everyone understanding what they are trying to say-A particular jargon is spoken in the field of computer studies - and it is spoken in English, so it would seem silly to be teaching programming in another minority language (in terms of the rest of the world). Sure it would be an awesome idea for school -it would cause too much confusion when you go for a job interview and you ain't too familiar with the original terms-To stay up to do with world trends, we need to follow the main stream! Using African terms would be stupid.-It depends what you by "new" computer terms. If you mean translating the current terms into another language that is fine, if not, then there is going to be a problem when communicating with another Computer Scientist-Computer terms are pretty universal - to try and translate them when most people understand them already is a bit pointless-it will then be restricted and computers will cease to be universal use.-Computer Science is an international field, creating new terms would lead to more confusion.-I don't need them and term are terms, they are understood worldwide so changing them would be silly-From a tutoring perspective, instead of asking a person whether they understand term X, you'd have to ask them whether they understand term X, whether they understand term X-In-Language-A, whether they understand term X-In-Language-B, and so on. It would-It would probably just cause added confusion, because there would then be multiple terms for the same things.-The world is becoming a global community, the majority of which can understand and communicate in English. For South Africa to remain competitive with this global community we have to at least stay on the same playing field!-English exists as the de facto language, second only to mathematics. Computer networking exists internationally and thus an international form of communication is required. To teach computers in relatively small scale languages (such as African languages) -why re-encode existing terminology in another language thereby complicating communication by different language speakers.-It would be useful to speakers of those languages to be able to refer to computer equipment in their own language.-Current terms are used internationally and it is not practical as computer science has international impacts, ie. programs created by S Africans can be used internationally, so wouldn't it be better to have a few less words to translate?-African languages are very complex and not ideally suited to capturing the marginal meanings of computing lingo without rounding the statement resulting in vagueness-It would help people who speak African languages to understand certain things more but if they took the same terms derived from African languages and tried to apply them to programs used in the rest of the world other people would not understand what they-don't think it'll be used as widely----some words are better explained in English. trust me.-Only African's speak African languages and the majority of the Africans who can only speak African languages live in the bush and don't even have access to computers.-English is the basic language that is used and inventing new words in other languages would mean more work especially for those who do not understand the African languages already. With 11 in South Africa alone, it will also mean that one will have to adopt-many people in many areas need to learn how to use computers and it is difficult for them to do it if they are not English speaking-English is universal language and the most appropriate to teach with. The understanding of comp sci should be tackled not tne language-it'll just make using computers unnecessarily more complicated-not sure if there would be any benefits.-Majority of the population in sa speak African languages-The use of African languages is a good idea, but changing terms is a bad idea because south Africa is part of the global economy and thus should use internationally accepted terms. Imagine a south African saying, "I don't know how to say it in your lang-Because there have already been standards that have been set in place, and there is enough ambiguity in computer science as it is. Introducing new computer terms would only confuse people even more, plus they would only be used by a very small minority in

African languages are dead. Too few speakers. Lets face it, most African languages did not even have a written form, until introduced by Europeans. If you go to other parts of the world what use would it be to be able to do computers but in an African language that most European people would not be able to understand computers are international pieces of technology and English is generally accepted as an international language medium It would be easier for people who speak those languages to understand what is being asked. Because English is a universal language and if you then had to go anywhere else in the world you still would not understand. It would only limit you further. because I find computer terms in English difficult enough so if it were to change to an African language it would be even more difficult for me. I don't speak any indigenous languages, but I'm sure it would be to those who would use it and there would be lots of benefits to them It will make things easier for two people who are not fluent in each others language to understand each other if the technical terms are the same. make computer literacy more available to non English speakers well I'm not African but im sure that if you translated it it should be easier to those who understand that language and therefore there wont be as much a problem of people failing and therefore we wont have such a large uneducated country it would be difficult to express some technical terms used in English. Because the world of computers is based on the English language. Doing computers means you are planning to expand your career beyond Africa. This means it's best to understand using computers based on English as this is the language spoken out there in the if its being done in all the African languages then maybe it would but not in one specific one because at an institution like this one there are many foreign Africans who speak different African languages Very little software supports African languages anyway. The population that uses the languages is tiny, even much larger languages are adopting English computer terms. This question depends on the availability of literary material and textbooks. Its not difficult to just get use to an English version of words, and once outside SA these words would have no use and the user would have to learn English terms anyway We need to look at Computers on an International level. We need to communicate internationally, especially through computers...Microsoft/Open Office are in English - how would it make things easier if the computer terms were in an African language when I Coz we understand Local languages better but it has to be a mixture of local and English coz local only will create new problems of its own I tell you. But overally Local language YES PLEASE because it could create confusion English is an international language that is used for computing terms. I think it is unnecessary to change a norm once it has become universal. It might increase the confusion ell the Chinese operate computers in their own language so given enough attention to the matter by the rightly skilled people this should also be possible if it will help them understand computers better then it should be done might not understand them I don't think there is a need for that right know maybe in the future So that everyone knows what's going on it wont be used in the business world. all international business is done in English, so an African language wouldn't be useful Because everyone can understand English, but not everyone can understand African languages, therefore it is easier to have the terminology in English. Otherwise, seeing that the tests and exams will still be in English, people will have to translate the t I think computer language is based on English and direct translations would be difficult if you put them in African languages it would be ridiculous to try and change the language we learn in. English is the primary language in this global society and we stop this habit of finding ways to avoid learning the language. we need to push our selves. if you want to be a member of the becoz it will be easier for us to understand what we are required to do. so the people who have difficulty understanding English could be more clear on the instructions, but I disagree strongly with conducting lectures in African languages as English is the official language of the world and the internet. African languages are not as universal as English therefore may be difficult and less practical for others to use it will be difficult to adapt, to i.e. Xhosa terms that will be used if this was done then I would struggle as I speak English and so would not know what was expected of me.

15) Are you familiar with open source software (Linux, OpenOffice, Mozilla, Google) in the African languages?

I have used it before *27%*
I know it exists but I have never tried *27%*
I have never heard about it *46%*

Comments
I am an English speaker, and so using an African based language web searcher seems a bit round about. I do think, however, that it does have practical use for those who cannot speak other languages easily.-I use open source software, but never in one of the African languages, although I've taken a look at Google in Zulu/Xhosa before for interests sake-I assume you can choose an African language option.- I think that the people at Translate.org.za are doing some awesome work.- It's a fantastic idea -- a great way to help along computer literacy by removing the language barrier. - I like – I am only sure about Google seeing that I use it on a daily bases. I don't think that this applies to me though as I'm an English speaking person. I have used OpenOffice but in English. Would use it instead of Microsoft as I have to pay for Microsoft. I'm used to operating in English when using computers I've never heard of it, maybe because its not talked about so often or advertised. not here anyway I have used, open source but not in an African language Only use open source and FreeBSD. I have used it before, but did not that they came in other languages, other than English Its not that hard and its also not a walk in the park wow, that exists? would be good to know it exist ??? only used the software in English...if that's what you are asking I have been running almost exclusively in Gentoo Linux, which I installed myself from stage 1, for the past 5 months. I also moved from Microsoft Office to OpenOffice about 7 months ago. Although, I've had reasonable exposure to open source since the age of used open office in prac , a bit hard to adjust to when we are already used to Microsoft interface I wouldn't want to use it though because I can speak and read English very well and I think that it is better that way coz I read English faster than I do my own language. Have used English version, didn't know there were versions in other languages. If Ubuntu (Mark Shuttleworth) supports African languages You sure about Google being open source? It's cool. Really funny to Google in Xhosa! I use open source software in the English language Good software, but I don't recommend it to new users, i.e. people learning to use computers for the first time. I.E. Linux THAT'S COOL THOUGH. Wow none I thought they were American products and therefore didn't think they would be available in other languages other then English and maybe other European languages. busy with it in cs1L

16) The best way to help students who are struggling because of language problems is:
to give them more English teaching *37%*
to use both English and their mother tongue to teach them *41%*
to provide them with support material in their mother tongue *22%*

Comments
This does have dire consequences though, because you would either slow the class down, or you would lose the people who do not understand both languages.-I am not a teacher, and I am therefore not qualified to answer this question properly, I guessed. - although they will probably still have to write exams/pracs in English explain in English then further in their mother tongue if they don't still understand. problem is that with 11 official languages spoken in south Africa the teacher may not know every mother tongue of each student. is to drill them with the language. they should be made to understand that English is important and instead of pampering them they should be forced into learning the language. I know this sounds harsh but we are at Varisty now. more English teaching, does not guarantee better understanding. All 3 would be advisable yet option 2 is probably the most effective What are they doing at University if they can't speak properly?????? University is suppose to be your top 10% of academics in a universal context. You can't relax rules too suit any tom, dick and harry. Maybe in the bridging year they should be provided If talking specifically about Computer Science then they'll have to learn English to be effective. I wanted to select all of the above none In the end it will always help them to communicate with ppl,nt only in their home country but in the world... besides,this will mean that they speak in 2 languages! that fascinating!

17) The University should produce support material in the mother tongue of the students to assist their learning
Strongly Agree *13%*

Agree *48%*
Don't know/ not sure *20%*
Disagree *12%*
Strongly Disagree *7%*

18) I think that to use some material in African languages (together with the existing material in English) at University would be:
a good idea because... *52%*
a bad idea because... *48%*

Comments
Its a very silly idea.. and wouldn't catch on. Computer Science would be better learnt in English seeing as programming languages use English to define technical details such as class libraries.-Again, you would alienate those students who did not speak the chosen language.-I think it will help the people who aren't great at speaking English to understand the concepts and ideas presented more thoroughly-it is easier to understand complex problems if they are explained in a language I fully understand. Having it explained in both, English and an African language will help explain things to students whose mother tongue is an African language and it will a-English is regarded as being fairly global, African languages are not. Foreign students would seriously struggle with this. Supplementary material yes, actual course content in other languages, no.-Everyone at university level should be fluent in English-Use mother tongue to convey intricacies, and English to broaden sources of information-well it's a good idea if they would like it, no one should be prevented from learning in their own language if that is there preference.-as stated above-Implementing a course in one language will reduce the misunderstanding that comes from switch from one source to another. Perhaps a better approach to increasing understanding in one language when at a tertiary level is more emphasis on a language at a se-Comprehension of the subject would become easier-it would waste resources and manpower that could otherwise be used to improve facilities. besides most programming is done in English, therefore there is actually no point in teaching it in any other language, in fact it would be a disservice to teach it -The information industry and computer science industry where graduates will gain work operate using mainly English, therefore the students would be disadvantaged.-learning the terminology in English can be difficult enough. If you don't have a firm understanding of what is being taught in your own tongue it may become overwhelming.-it will help people to understand what they are doing, however it is going to be incredibly hard to do because you are expecting lecturers to know multiple languages, for every student in the class! Impossible and unfair. Especially considering students -If you are going to be writing exams in English you need to understand the content of the course and be able to articulate yourself using the correct terminology. Are there equivalent words in African languages for computer jargon? Don't they borrow from-it would help students get a better kick start to using computers-there are gazzilions of African languages. how would you know which to choose.-application of whatever learnt will be in English thus the need to learn and practice in English.-it is a good idea-I guess it would aid the people who do not speak English as a first language. This, however, will not encourage people to learn English better.-it would help the students understand the concepts better - but English fluency should be encouraged to allow students to be globally competitive.-student will never bother to learn how to express themselves in English and thus are unable to advance in the working world where English is the media of communication.-it limits one to a language that they are unable to use internationally as a person who has a weak command of English will resort to the African language. Besides our African language is not equipped with words that can explain some concepts of comp sci-While the main terms and definitions should remain in English, the core concepts can be explained in any language.-I don't know-At the lower levels, it would encourage people who were afraid to do Computer Science because of language difficulties to go ahead and try it.-It would again just add confusion, and would make communication between English speakers and African language speakers more difficult. Having English as a standard medium of instruction is a good idea.-Please see above, global playing field and all that!-It is the 'easy way out'. By bypassing language difficulties now, African language speakers must suffer later in life when they try to fit into a globalised world.-some people tend to understand

thing in mother tongues rather than English, however not everyone can read their mother language as much as they would with English, me for example.-The universal language of computing is English, and as such Computer Science should be taught in English. Material in other languages is for supplementary use only.-it would give people who do not speak great English an ability to catch up, but organizations like Microsoft are not going to hand out additional note for MSDN for people who don't speak English well.-It could help further their understanding while they would still learn the English terms so that they could be both fluent and understand to a greater extent.-for those in foundation courses and others not entirely at home with English-it may help students who are not familiar with English but it may also cause more confusion as some words or phrases are lost in translation. -Degrees are an international merit, not a local one. In the world arena African languages are worth nothing, while English is.-there are English-only speaking students at University and they would be at a disadvantage. Separate African language material is the best option.-total confusion is bound to exist amongst the use of computer terms.-Almost everyone who comes to university is able to speak English, if they are unable to they should have gone somewhere else. It will allow better understanding of terms. Students will eventually get used to the English terms For many, English may not be one of their strong points but it is the language that most people can easily relate to. One of the reasons why not so many people are not good in their English is due to the lack of exposure. With an increase in the exposure for those who are not fluent and find it difficult to cope with English It will give every single student an equal chance at success. And this way, nobody will be able to say that they didn't understand. some people do not speak English as their first language and if they are just starting to learn how to use a computer, this could pose quite a problem. it would help people who speak the African languages English is important in all spheres and should be learned. Some people can not further their studies because they battle in English and why should they not have an option, they have as much rights as English people do to have it in their own language It could help African language students understand. it should be offered as an external thing for those students who are struggling. it will help understanding of basic concepts One may have problems adjusting when they do go into industry Because it would help to clarify certain things for the African students who are struggling with concepts and that are not fluent in the English language. This will then be at a disadvantage to others who are not familiar with the other African languages. Most computer terms are in English. What's the point of teaching stuff that wont mean anything to any other English speaker (majority). I agree to support material, but it should not be made mainstream, but sidelined, and only for certain cases of study Its a good idea to help those who have no clue but are you going to provide all the material for ALL the languages in the country its way too much. Rather have additional lessons in their language.... tutorial wise it takes the international aspect away an which language would you use, as there are so many- conflicts could arise it would help students who don't speak English very well to understand the work better ...most of the students would be catered for. In only the case of being able to have access to the support material would be a good idea for those who speak an African language and are struggling to grasp certain concepts more than the actual terms. it could assist students who struggle with the English language. however this should only be offered as an extra course and should not hinder the learning process of those who are capable with English. It will make the understanding of the subject easier, but it should be kept completely separate from the English section. students who have a low understanding of the language can still understand well it would benefit the other people too many African languages. Africans are diverse in their nature. which language will you pick? then we might as well teach in all the languages of the world. Maybe I am biased as an English speaker, but Computer Science is developed by the Western world and should demand Western language. If I were to become a sangoma, I would expect to have to learn an African That will cause people to be partly dependent on translations into their mother tongue when they do not understand something. What will happen then when they are faced with a similar problem in the real world and these materials are not available? it gives everyone an equal chance of passing and it makes learning for foreigners less challenging and more likeable for a better understanding Itt helps students understand more There is no demand at the employment level for such qualifications. University is meant to educate us, in subjects and knowledge areas useful in our futures Exams will still be written in English. If a subject is studied in 2 languages, this will only cause confusion when exams are written University is on a tertiary level in which international, other than African per se, join, and I think it would make things very exclusive I for one will understand better help people To manufacture study guides in over 11 different languages would

create an immense financial burden on the university it might create confusion many students from African cultures are very interested in computers and the IT industry even though they sometimes very little experience with it. To provide them with material that they will understand in their own language will feed their curiosity where at least concepts are grasped rather than crammed. In the experience of my own language (Shona), most of the words used in computer science are none existent so inventing the words first, and then teaching them to someone trying to convince them it is their mother language when they have actually never m If in English and an African language it will them with English as they ill see the connection with there home language. it would just complicate things it might just take a lot more effort on behave of the university and might just confuse students even more It helps those that find it difficult to understand in English, and improves communication To make it fair for everyone to understand The whole industry and the rest of the computing world operate in the English language.. Therefore it would be more beneficial for the students battling, to learn English better then for them to learn the subject in an impractical language to benefit those who cant speak English many people won't understand half of the lectures. I think a 'one language' course is necessary for an effective program to work. People will study that information in that language and will then recall that information in that language, once again this may prove to be time consuming when they have to translate what they have studied before they can answer the questions. majority of south Africans speak African languages and it would be beneficial in developing all peoples skills in computer literacy it is plain ridiculous! instead of wasting time on this they should send time improving the course as a whole. it should be a requirement that students must have a certain level of English proficient before entering varsity. as is the condition with mos a clear understanding leads to better results English is the most popular language in the world and when speaking English, everyone will be on the same level. It is not like native languages are forbidden but they should be used in discussions with friends but never when communicating with the examiner, English is the official language of business and international trade. extra material should just be offered. There are many African languages and having to adapt to all of them would be a hindrance to learning English is the medium of communication then the other subjects would be expected to do the same(provide material in other languages) and then it would become very expensive and there would be no end to what languages should provide such material. many students don't understand African languages whereas many people understand English it would help out those students who find English difficult this could create controversy...I mean, whose language takes preference. it would help students who have an African mother tongue with some difficulties they might develop. it would just make the situation for learners worse. I mean English is one of the major international languages and people have to learn in English to competitive internationally. It prevents people who speak African languages from feeling alienated. wont understand IT would be better for the people to be taught to improve their English as it has become the standard language of communicating in the world , this would help them in their future and not just for the course Why are people trying to make university easier to pass they can get to learn to use both but I am comfortable with the way things are. If a person wants to study computer science, they need to learn English simply enough. Changing course designs and schedules will be difficult to accommodate certain individuals. Don't study computer science if you're not willing to learn English first! it will make the speakers of the African languages understand more easily, if they are not that English literate it would allow for a higher penetration of computer science education. However, I believe that this should merely be used as a tool to reach a point of English only. In terms of programming and programming concepts, the only way forward is in English. The It'll be beneficial for the person to learn English anyway. This is an English-medium university. While it might be beneficial to have the odd support tut in an African language, creating bilingual teaching tools would be above and beyond university language policy. the majority of comp sci users understand English it is sometimes easier to understand a concept in your mother tongue, which will make it easier to show your understanding in the exams, even if you are not writing in your mother tongue. Students need to know the English terms, but they should also be offer It would help the students who do have a language barrier have a better opportunity to grasp concepts, but they must not be allowed to neglect developing their comprehension and understanding of the English language. ...the labour market is looking for Black professionals. This would ensure that more Black people qualify into this particular market, and benefit BEE. Many people come to university with ambitions but language proves to be a problem which provides unnecessary limitations it would help those battling with English to learn an important skill The

basics of Computer Science can be taught in the mother tongue, and thus the foundation of understanding can be formed without (hopefully) any loss of information. unfortunately it would only apply to this country and only a small population of users. If they were to go over seas it would compound the problem. Students who need the additional information can make use of it to understand what they are required to do, and it will be easier for them, esp. if they know it is available for their use. you need to split the classes then or people who don't understand any African languages would be put off of coming to lectures when they don't understand a word of what is being said. SOME PEOPLE UNDERSTAND THEIR WORK BETTER IF IT'S RE-INFORCED IN THEIR MOTHER TONGUE. It would be very confusing for students whose mother tongue is not English!They would probably need more Support in English so that they can understand. I am not sure. it would benefit those who cant speak English, but may confuse those who can. maybe there can be an English lecture and then one in African languages on the same day? It would help n0n-English speaking people to understand more. not all th students will understand the particular language that would have been chosen by the tutor and a tutor would have to lern a lot of languages and that alone is very difficult or two or more tutors would have to be present to compliment each other One day when students that have had terms explained to them in their African language of choice find themselves in a place where nobody speaks that language (or in an English test), they are going to be in serious trouble. Also, which African languages its just better to have them separate. it will help those hu dnt speak English fluently, bt these wud obviously hav to be a separate frm the eng wrk... Then the university would need to employe more lectures who could lecture in the other languages. If this would happen, already high varsity fees would increase thus making university inaccessible to those who can just afford the fees now. I think that students who seem to struggle and are L2 learners of English should be doing a required English course and while they are registered for that they can apply for manuals or whatever is needed in the course of which they need it for. only fair then everyone would understand,but lectures should be in English. it would help the students who don't speak English. As those people who do not speak an African language would then struggle with the course provide in that language not internationally marketable "

19) The main problem with using African languages to teach Computer Science would be that

There are no computer terms in the African languages *63%*
Students who do not speak such languages might have a problem with that *61%*
Students who speak such languages would not learn enough English *52%*
It would be too expensive to create new material in the African languages *46%*
Manuals and handouts in the African languages would be difficult to understand *34%*
There are no lecturers who are able to teach about computers in the African languages *31%*
It would not be a problem *1%*

Comments

Training of lecturers is huge and cannot be underestimated. Experienced lecturers can convey material so much better, they really make a difference. The second option is a little confusing, I am assuming your intention would be to offer courses in the - Computer Science is developed by the Western world and should demand western language.- Isolation from the global community.- Most of the additional material that may be important is found on the internet and is in English which means that students still need to have a fair understanding of the English language - a waste of material. English has been a common language for students of many culture, so why not keep it that way. I don't think it would be TOO expensive, but your problem would be convincing the finance boards to give out the money for it, and finding the resources to create the manuals needed A given lecture, I feel, should be in one language only. It might prove to be a waste of time in that a lecture must be repeated. Most computer operating systems and programming languages are based on English, and having manuals in an African language may just confuse matters. none

20) If the University starts producing support material in African languages, speakers of such languages:

Will be more interested in studying about computers *51%*
Will be more interested in coming to this University *48%*

Will have more problems when they find a job *38%*
Will have more problems continuing their studies *23%*
Will probably not use it *21%*

Comments
Will probably use it-they may not choose to use...learning English is important in contemporary society and they may see from this view point. - "will have more problems continuing their studies".... elsewhere - It might be a temporary crutch to help varsity, but you cannot get round the fact that programming languages are based on English, IS and computer science terms are in English even when invented by scientists who spoke different languages. The additional I think that if you can speak English, you should go to Fort Hare. Rhodes is quality, and I'm afraid that introducing a program for African languages would lower the standard of the university drastically. We don't want people who cant speak English. (They w Would further be limited unless it was only used in the sense of helping to guide them through. The actual lectures should continue to e taught in English. They may then want other departments to under-take these sort of initiatives. It will be harder for students to take other subjects that do not offer the African languages options and therefore will have trouble completing their degrees What happens if South Africa follows the trend of other African countries and people need to go over seas to find work to support families living in poverty here, they will need to know how to speak English. There is the concern they would not develop their English, which I think is fundamental for communicating in the global context I think they will have LESS problems to find a job. Sound knowledge of English is important, but being a highly-qualified individual who understands exactly what you are talking about is essential in securing a good job. Students will neglect to read the English notes! none

21) Please type your comments here:
Answer given (full) Once again, a very silly idea... which has the potential of bringing down education standards and adding confusion to what is already a very difficult course. I think it would be a good idea, providing a better understanding of the subject to students who are not primarily English speaking. It may become difficult to choose which African language to use in teaching Computer science...Do you look at which language is most widely spoken or do you provide modules in all African (or South African) languages? It's a fantastic idea, but I think that practically it might be more efficient to have "remedial" classes (without any negative connotations of the word) for those who aren't coping because of language difficulties. It would certainly be more efficient t Maybe I'm just being short sighted, but I don't think it would be feasible or that beneficial to create material in the African languages. I know a lot of students who speak African languages who are coping better than English speakers with the current ma computer science would be a lot more interesting and comprehendable if the lectures were not so boring,and the lecturers did not go so fast. especially for those whose first language is not English Computer Science will, if taught in the different languages, help people who do not really understand the English language fully a lot. And if the material that they make available for all the different languages is user friendly, then I don't think that I think that everything is fine the way it is, at Rhodes anyway, because I don't think anyone cant understand the lecturers. I stongly believe that right now the university is catering for everyone along these diverse boundary of languages in terms of the English language as it is the only world Language and the most frequently being spoken. Its a good idea to integrate these languages but its no use having a degree in a foreign language if you can't implement it in the international market. People in this case can learn in their language but they MUST learn to do it in English as it is them I hope my input will be of help to you... Pros and cons. A subject should be thought in the language used by industry and the available literature. There is no use learning something in a context in which it cannot be applied. It may be uncomfortable learning a subject in a foreign language but it It would be expensive but is essentially a good idea, but should computer literacy be offered with an African language manual, it should be optional whether a student wants to learn with the African supplement or English supplement as al lectures are in en I think the African language, should only be used for understanding purposes and not necessarily for teaching during the lectures, but as a tutorial kind of thing. Instead of using precious money on making new books,I think this resource should be

used to make simplified computer science text books but they should not be too simplified because then we won't be doing computer science at university level. I hope this never happens, yet I agree with providing additional material. It would be a great benefit to African student who do not speak English as a first language to have the more complex concepts explained to them in their own language, but this would help if it were in text form, since the time taken to re-explain something No matter what ethnic background you come, even if you are a white person, and you can't communicate in English clearly (no matter how clever you might think you are), you'll only end up in grease monkey job that pays the bare minimum. I mean lets help pe Simply, I do not think integrating African languages into the Computer Science syllabus is a good idea.. Perhaps if individual tutors are assigned for those having difficulties with the English language, but essentially it would slow the rest of the class the English language is the standard language all over the world and if people are educated in computers in their mother tongues they will not be able to communicate with other users as they do not speak the same language. Good communication is the key to Nifty survey, but the crux of the issue is that Rhodes is primarily an English medium university. - Good questionnaire! I think that English would be the best language to learn computer science in since it is a world recognized language and thus it will play a part in further equipping students with the desired eloquence. The idea (as I understand it) is to make things easier, not harder. If people cannot share their ideas, their coding will be of little use (how will they work in teams?). This whole idea is very similar to being taught how to speak Afrikaans in English (a good luck !!! I think that introducing the use of African languages into universities is a very good idea, but the problem comes about wen otha ppl or sumppl do nt think that it is necessary,and even if it is agreed upon, how to go about implememntin it??? will take qui Introducign new languages would incourage more non English speaking people to attend university but if they wish to pusue international careers they will have a problem finding a job where these African languages are not the main language used. Even in So Is there a minimum requirement of English when going into University? there should be other wise a person who is not a competent speaker of English should be doing required courses. why not just make two handouts - optional which one the student takes. student stipulates at beginning of year which kind of handout they want.

22) Please leave your contact details (phone nr, email address) if you want to be contacted for an interview on this topic. 30

Appendix D: March 2008a questionnaire (English version)

1) Your Language:

isiNgesi *35%*
isiXhosa *74%*
isiZulu *13%*
siSwati *0%*
isiNdebele *0%*
Xitsonga *0%*
isiBhulu *0%*
Sesotho 4%
Sesotho sa Leboa 4%
Setswana *0%*
Tshivenda *9%*
Other

2) Which kind of area do you come from?

Urban (town/city) *25%*
Semi-urban (township) *54%*
Rural *21%*

3) Which kind of school did you go to?

For African school 71%
Former Colour school 8%
Former Model C / private school 21%
Other

4) What experience did you have with computers before coming to University?

Little or no experience (i.e. only videogames) 46%
Basic literacy (i.e. using e-mail, Internet and word processing/spreadsheet) 46%
Fully literate (including some programming) OR student about computers in school 0%
Other 8%

5) Have you ever used software in your language (i.e. OpenOffice, Firefox etc. with the menus in your language)?

Yes 13%
No 83%

6) I love my language

Strongly agree 69%
Agree 28%
Not sure 3%
Disagree 0%
Strongly Disagree 0%

7) I read and write better in my language than in English

Strong agree 34%
Agree 24%
Not sure 21%
Disagree 14%
Stronger 7%

8) I can speak about computers in my language

Strong agree 0%
Agree 21%
Not sure 29%
Disagree 29%
Strongly Disagree 21%

9) My language should be used more often in education, to explain things to students
Strongly agree 35%
Agree 24%
Not sure 24%
Disagree 10%
Strongly Disagree 7%

10) I love English
Strongly agree 57%
Agree 35%
Not sure 4%
Disagree 4%
Strongly Disagree 0%

11) I love computers
Strongly agree 74%
Agree 18%
Not sure 4%
Disagree 0%
Strongly Disagree 4%

12) I am able to use computers
Strongly agree 3%
Agree 62%
Not sure 24%
Disagree 7%
Strongly Disagree 4%

13) When speaking about computers with somebody who speaks my language, I prefer to speak in.....
English 27%
My Language 14%
Both at the same time (mixing language) 59%
Either or, it is the same for me 0%
Other

14) In your opinions, how useful would each one of the following be to help speakers of your language to learn about computers? (1=not useful, 5= very useful)
Software in my language (i.e. Windows, Internet Explorer, MS Word, Excel, PowerPoint etc. in my language) 3.1
Audio-recorded (spoken) explanations and video tutorials in my language 3.8
A glossary (a mini-dictionary) of difficult English words with an explanation in my language. 4.3
Books and handouts written in my language 3.7

15) Other things which can be helpful

Teach some difficult names in my home language, English can be a difficult language to understand; Special attention given to those who are unfamiliar with computers; A software that will interpret English to a specific language; I would advise students to have basics information of a computer and to be more advanced; To teach students a lot more about computers starts from the beginning e.g. Typing....; I would advise that if students find some difficult concept hard to understand there should be tutors or somebody who could explain to them in their mother tongue and then the student can look at the problem again in English; Education can also improve by allowing students to take part in finding out information rather than spoon feeding them everything; More search engines should be installed so that students get more information while explaining things; nothing; I would say it's partly ok to teach in English; Lecturers who will be able to lecture in my mother tongue; I cannot think of any! Workshop; I think one thing that can be helpful is that when teaching the people they must be taught in Xhosa. But for the computer parts and names they must be taught in English.

16) If your mother tongue were to be used (together with English) to teach about computers, how big would each of these problems be? (1=not a problem 5=big problem)

Manuals and handouts in my language would be difficult to understand 2.5
It would be too expensive to create new material in my language 2.8
There are no lecturers who are able to teach about computers in my language 3.1
There are no computer terms in my language 3.4
Students would not learn enough English 3.3
Students who do not speak my language migh have a problem with that 4

17) Other problems?

If many students speak many languages and all require the use of their languages then that can be a big problem;Things will be alittle dificult for the teacher becouse many people will speak different languages;not understanding the english in computers;None at all; It would be unfair to other people who do not speak my languge; Then everyones mother tounge will have to be used to help them also; We wouldnt understand each other very well since everyone is speaking their mothr tounge; concepts and methods would be much easy in my language; I agree with the contradiction languages like Xhosa and Tswana;

18) Please write additional comments here

It would be great if some of the terms where thought in my home language to make things easy for some of us who find the english terms difficult at some point; Ama Africa kwizinto ezifana ne computa aba bandakanywa lonto ibenza babengasemva kwi technology. 5585; Ukuba abantu bakuthi banokunikwa ithiba kwezekhompyutha bafundiswe beselula. 5585; Ikhompyutha mayibe sisifundo esinyanzelekileyo kwakumabanga aselula 5585;THEY ARE. I HAVE NO ABOUT LEARNING IN ENGLISH BECAUSE I DON'T KNOW MY LANGUAGE VERY WELL; What is the easy way that students who don't understand computers will be easy for them reach; Computers are useful in English because it helps interact with people around the world; I think it would be very difficult to satisfy every student in terms of language in a lecture, because we all different but if they are tutors that are there to help students in their language that would work because they would get both sides of the languages. Also when getting a job it would be helpful to know your information in English and in your home language as we know to work anywhere in the world you have to know English; Communicating in English helps us reach one understanding and is the better way of making sure that we understand each other very well; I think it may be helpful if computer may be studied in my language; I think people who would study computers in their mother tongue wouldn't be as complex as those who studied it in English; I think it could be useful if we get a chance to use computers in our language though it might be a little bit hard at first but it's always okay to learn new things; no comment; Computers which are not taught in my language could be a problem because some English words; Good research; It would be a great idea to see material produced in our home languages, but also an impossible task. We have so many different languages that this would result in a big increase maybe in our varsity fees, and it is unnecessary, because most people can speak and understand English. Rather focus on having English lessons

to improve the literacy of people; i seriously think it will be a huge problem if we were to start now that i am in university to be taught in my mother tongue because firstly English is universal and half the terms like science we don't have them in our language so it will take long to do this change maybe it will work with the other generation; It is better to learn in English; I companies have to support the rural school with computers so that students will able to cope with high education; I think this would very be disturbing to many people.engliish is south African's medium language. And if you try to teach computers in one African language know that you will have to teach it in all languages because maybe some students do not even know African languages; I think it is a good idea to translate to other languages;

19) Please write your contact details (name, phone nr, email address) if you want to be contacted for an interview. 25

20) Would you like to help translate software and teaching material for Computer Science in your mother tongue?
Ewe 68%
Hayi 32%

Appendix E: March 2007 questionnaire (isiXhosa translation)

1) Ulwimi lwakho
IsiNgesi
IsiBhulu
IsiNdebele
IsiXhosa
IsiZulu
IsiSwati
SeSotho
SeSotho saLeboa
XiTsonga
Tshivenda
SeTswana
Olunye

2) Uvela kwindawo enjani?
Idolophu/ Isixeko
Ilokishi
Amaphandle/ Iilali

3) Ufunde kwisikolo esinjani?
Izikolo ezazizezabamnyama
Izikolo ezazizezabebala
Izikolo ezazizezabamhlophe

4) Lwazi luni owawunalo ngeekhompyutha phambi kokuba uze eYunivesiti?
Beluluncinane okanye lungekho (ziivideo games qha)
Ulwazi olungephi / olungundoqo (Umzekelo ukusebenzisa imeyile, i-Intanethi kunye nokubhala ngekhompyutha)
Ulwazi oluphangaleleyo (oku kubandakanya nezinye zeenkqubo zeprogramming) okanye wafunda ngeekhompyutha esikolweni
Olunye

5) Wawukhe wayisebenzisa isoftware ngolwimi lwakho (u-OpenOffice, uFirefox, njalo njalo ngeemenyu kulwimi lwakho)?
Ewe
Hayi

6) Ndiyaluthanda ulwimi lwam
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

7) Ndifunda futhi ndibhale ngcono ngolwimi lwam kunesiNgesi

Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

8) Ndingathetha ngeekhompyutha ndisebenzisa ulwimi lwam
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

9) Ulwimi lwam kufuneka lusetyenziswe nangakumbi kwezemfundo ukucacisela abafundi izinto
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

10) Ndiyasithanda isiNgesi
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

11) Ndiyazithanda iikhompyutha
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

12) Ndiyakwazi ukusebenzisa iikhompyutha
Ndiyavuma ngokupheleleyo
Ndiyavuma
Andiqinisekanga
Andivumi
Andivumi konke

13) Xa ndithetha ngeekhompyutha nomntu othetha ulwimi lwam kungcono ndisebenzise ...
IsiNgesi
Ulwimi lwam
Zombini ngaxesha-nye (ndixube iilwimi)
Nalo naluphi na, kuyafana kum
Olunye

14) Ngokwezakho izimvo, zingaluncedo njani ezi zilandelayo, ukunceda abantu abathetha ulwimi lwakho ukuba bafunde ngeekhompyutha? (1 = akubalulekanga, 5 = kubalulekile kakhulu)

Isoftware ebhalwe ngolwimi lwam (umzekelo: uWindows, u-Internet Explorer nezinye zibhalwe ngolwimi lwam)
Iingcaciso ezishicilelweyo (zentetho) kunye nezifundo zevidiyo ngolwimi lwam
Ingcaciso-magama (isichazi-magama esincinane) yamagama esiNgesi anzima ehamba nenkcazelo ngolwimi lwam
Iincwadi namaphetshana akhutshwayo abhalwe ngolwimi lwam

15) Ezinye izinto ezinokunceda

16) Ukuba ulwimi lwakho belunokusetyenziswa (ndawonye nesiNgesi) ukufundisa ngeekhompyutha, zingambi kangakanani na ezi ngxaki?(1= akukho ngxaki, 5 = yingxaki enkulu)
Iincwadana kunye namaphetshana abhalwe ngolwimi lwam kunganzima ukuziqonda
Kungaduru ukudala iincwadi nezinye izinto ezintsha ngolwimi lwam
Akukho bahlohli banakho ukufundisa iikhompyutha ngolwimi lwam
Asikho isigama sekhompyutha ngolwimi lwam
Abafundi abayi kuba nakho ukufunda nokusebenzisa isiNgesi ngokwaneleyo
Abafundi abangaluthethiyo ulwimi lwam banganengxaki naloo nto

17) Ezinye iingxaki

18) Nceda ubhale iimbono zakho ezizezinye

19) Nceda ubhale iinkcukacha zakho (igama, inombolo yomnxeba, idilesi ye-imeyile) ukuba uyafuna ukuba nodliwano ndlebe nathi

20) Ungathanda ukunceda ekuguquleni i-software kunye nezinto zokufundisa ubuchwepheshe beekhompyutha?
Ewe
Hayi

Appendix F: October 2007 questionnaire (English version)

1) Your language

isiNgesi *3%*
isiXhosa *73%*
isiZulu *12%*
siSwati *0%*
isiNdebele *0%*
Xitsonga *0%*
isiBhulu *0%*
Sesotho *0%*
Sesotho sa Leboa *3%*
Setswana *0%*
Tshivenda *9%*
Other

2) Which kind of school did you go to?

Former African school 72%
Former Coloured school 16%
Former Model C / private school 12%

3) Have you ever used software in your language (i.e.Webmail, OpenOffice, Firefox etc. with the menus in your language)?

Yes 22%
No 78%

Comments:

I think it would make me understand things better. Ilungile kodwa esinye isiXhosa sayo siyabhida kancinci. The terms seem much much more complicated in Xhosa. I haven't used it because it wouldn't make sense to me. Kodwa kwakunzima kuba isiXhosa sibanzi yaye sindzima. Kunzima kakhulu ukulandela imiyalelo yolwimi lwesiXhosa kungoko imiyalelo apho yayibhalwa ngesibhulu. I tried using darabase and powerpoint it was alittle bit different than usual, but in a good way. The would be a problem with some technical words in Xhosa. I found it so impressive. Zange ndiyisebenzise kuba inamagama anzima. It was easier to understand some of the terms. Akuqhelekanga kwaye akulunganga.

4) Did you take part in the translate@thon **or attend Mr. Baileys talk?**

I did not know about them 71%
I knew about them, but did not go 16%
I went to the talk, but not to the translate@thon 10%
I attended both 3%

5) Did you use the English – isiXhosa computer glossary we developed?

If YES:	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
It was well done/easy to use	25%	38%	12%	21%	4%
It was useful for me	4%	27%	48%	4%	17%
It can be useful for others	26%	43%	13%	9%	9%
I prefer the print version to the on-line version	4%	22%	56%	9%	9%

Comments:

Kuba sendiqhele isiNgesi kwesisiXhosa nisisebenzisileyo iisentence azivakali, ngoko iyenza ndingayiqondi kakuhle. The Xhosa used is not easy, people these days mix Xhosa with other languages. Imbangi yokungayisebenzisi le ngcaciso kungokuba izakuthi ithi ukundibuyisa umva kaninnzi, umzekelo walento ndiyithethayo ngowokuba siphila kwilizwe elikhumshileyo nelithi lifune izinto ezikhmshileyo.we have been taught in English, it is very hard to understand just general terms in Xhosa and would even be hard in computer wise. It is they more comfortable to stick in English computing. It's how we learnt it. Ukusebenzisa incwadi akayi kukunika umkhomba ndlela nokuba ikhompyutha isetyenziswa njani.

If NOT why?
I do not speak isiXhosa 38%
I do not need it 46%
I want to use just English 8%
Other 8%

Comments:
As I am a Xhosa I think I know every word in my language. As stated above, the Xhosa is complicated. I'm Xhosa but i can't understand some of the terms. Kunzima ukufunda isiXhosa. I cannot read Xhosa. Andiyidingi kuba isebenzisa amagama anzima nangaqhelekanga ngaphezu kwawe English. I speak the Xhosa what is the use of reading it. If there was one in Venda i would use it.

6) How can we improve it?
You can always ask every student that knows Xhosa to help you with vocabulary. Le ncwadi inga nakho ukuphuculwa ngokuthi yenziwe ibeninzi kakhulu, kwaye ngenxa yezizathu zokuba bantwana bethu sebeqhele isilungu. Ibekho ingcaciso yesiXhosa. Simplify the language. Ngokubona kwam sebenzisani isiXhosa esingkho nzulu kakhulu. Ngalo ndlela nabanye abantu abafana namZulu, namaSwati banokwazi ukuvisisa imiyalezo eniyibhalayo kwezincwadana. By planning more glosary and try to explain how the computer works on a language rather than English. Ba isebenzisa amagama anzima nangaqhelekanga ngaphezu kwaweEnglish. Ningayiphucula ngokuthi nisebenzise amagama alula esiXhosa, futhi nithathe ixesha ukuyenza lonto ningayingxameli kuba izakwenza siyisebenzise bhetele le ncwadi. By talking/interviewing Xhosa speakers again. Le ncwadana ingaphuculwa ngokuthi ukuba abantu bayazinikelwa ngokufunda iikhomputha ngolwini lwesiXhosa. Ndinga le ncwadi ingaphuculeka. You can improve it by giving lots of computer

7) The glossary we developed....	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
.... is a good idea	52%	26%	16%	3%	3%
... should be done for other languages too	53%	27%	10%	7%	3%
I can speak about computers in my language	22%	22%	31%	16%	9%
My language should be used more often in education, to explain things to students	32%	35%	23%	7%	3%
Computer terms in my language should be used instead of the English ones	9%	16%	50%	12%	12%

8) In your opinions, how useful would each one of the following be to help speakers of your language to learn about computers? (1=not useful, 5= very useful)
Software in my language 3.5
Audio explanations and video tutorials in my language 3.7
A glossary of computer words explained in my language 3.8
Books and handouts written in my language 3.5

A person who can teach about computers in my language 3.8

Comments:
Lo mbono ngumbono omhle kakhulu. Ndicinga ukuba lo mbono ungatsho usondeze abantwana abamnyama kumasiko nengcubeko yabo le baphulukana nayo sithetha nje. This can help people who do not understand English in my language they can be able to use computer and understand computer language. Yinyani ingabaluncedo kumntu ongazange ayisebenzise ikhompyutha. People who cannot speek English will benefit from this but people who are used to English will find it hard to adapt. Ibalulekile kakhulu yonke into eniyibhalileyo kodwa ke, sanukufaka ingcaciso kulwimi lwesiXhosa lodwa. These would be useful as long as the English version is there for us to get both sides. I think a Xhosa person who can teach computers can work very well. The use of my language isiXhosa in teaching about computers can be helpful in teaching beginners of how computers work. Akunyanzelekanga ukuba kufundiswe ngesiXhosa kodwa ingakhona yona ingcaciso magama. Who are you going to communicate with if you are using Xhosa for people. It is very useful to have computers words/language translated into my language, because most of the students will understand these terms and understands what is meant by them. I think it is easier to read in a handout in my language rather than someone teaching me. I think your own language can help you think learly. I think if we can learn in isiXhosa many people can be interested in computers.

9) In your mother tongue were to be used (together with English) to teach about computers, how big would each of these problems be? (1=not a problem, 5= big problem)
Manuals and handouts in my language would be difficult to understand 2.8
It would be too expensive to create new material in my language 2.9
There are no lecturers who are able to teach about computers in my language 2.8
There are no computer terms in my language 2.7
Students would not learn enough English 3.5
Students who do not speak my language might have a problem with that 3.7

Comments:
This can only be helpful to student who use my language but for those who do not understand my language it will be difficult to understand computer language. There are a lot of official languages and all of them will need to be accommodated. If Xhosa would be used for all computer terminology, their English development would be at a slower rate. Other people might have a problem because not all of us would be one ethmi group. Ingalunga into yokuhlohlwa ngesiXhosa eklasini kodwa izibhalo zibengesingesi. I think it would be good to use my language with english because i personally experienced this in primary and high school and if there is a shortage of lecturers I am willing to volunteer myself for part. If my language were to be used, as long as there are unlimited resources then I do not think there would be any problems. Ukuba ulwimi lwesiNgesi lunokusetyenziswa kunye nesiXhosa kungabhetele, singazisebenzisa ngokukhululekileyo zombini ezilwimi.

10) When would you be available for an interview?
Before Wednesday 24 October 65%
During Swot week 31%
After Swot week 4%

11) Do you want to be interviewed?
Alone 50%
With another student 50%

Comments:
Lombono ndiyawukhuthaza kanobom kwaye ndicela niqhubekeke ngempumelelo ingagqithela nakwezinye idyunivesithi. Andifuni ndlwano ndlwano ndlebe kodwa ngumbono omhle kwabanye abantu. I really think

it's a good idea to use home languages in teaching computers because one will understand more but the thing is that students will see no need to improve their English which is a standard language in South Africa and it will be a problem when they communicate. This is a useful thing to do. This course would help it was done in high/primary level just as to prepare students. For at university level learning thing you have never been use to in doing that way is difficult. Umna ndicinga ukuba le program izokuba confuser abantu kuba xa uphangela naxa uzakubhala iExam awuzokubhala ngesiXhosa.

Appendix G: October 2007 questionnaire (isiXhosa version)

Indlela olubona ngayo ulwimi.

1) Ulwimi lwakho

isiBhulu	**isiZulu**	**Sesotho**	**Tshivenda**
isiNgesi	**isiNdebele**	**Sesotho sa Leboa**	**Xitsonga**
isiXhosa	**siSwati**	**Setswana**	**Other**

---

2) Ufunde kwisikolo esinjani?

○ **Izikolo ezazizezabamnyama** ○ **Izikolo ezazizezabamhlope**

○ **Izikolo ezazizezabebala** ○ **Ezinye**

3) Wawukhe wayisebenzisa i-software ngolwimi lwakho (u-OpenOffice, u-Firefox, nezinye ngee-menyu kulwimi lwakho)?

○ Ewe ○ Hayi

Nika iimbono zakho:

4) Waye wathatha inxaxheba kwi-translate@thon, **okanye wamamela intetho kaMnu. Bailey?**

○ **Option Button Zange ndive ngokwakuqhubeka** ○ **Option Button Ndaya kwintetho, zange ndiye kwi-translate@thon**

○ **Option Button Ndandisazi kodwa zange ndiye** ○ **Option Button Ndaya kuzo zombini**

---

5) Wakhe wayisebenzisa ingcaciso yesigama sekhompyutha esayivelisayo engesiXhosa nesiNgesi?

Ukuba uthi EWE:	**Ndiyavuma ngokupheleleyo**	**Ndiyavuma**	**Andiqinisekanga**	**Andivumi**	**Andivumi konke**
Yenziwa kakuhle/kulula ukuyisebenzisa	○	○	○	○	○
Yandinceda mna	○	○	○	○	○
Ingabanceda abanye	○	○	○	○	○
Ndikhetha incwadi kunohlelo olufumaneka on-line (ekhompyutheni)	○	○	○	○	○

Nika iimbono zakho:

Ukuba uthi HAYI, kutheni?

○ **Andithethi siXhosa** ○ **Andiyifuni** ○ **Ndifuna ukusebenzisa isiNgesi qha**

Nika iimbono zakho:

6) Singayiphucula njani le ncwadana?

7) Le ncwadana sayivelisayo yengcaciso-magama...	**SA**	**A**	**NS**	**D**	**SD**
... ngumbono omhle	○	○	○	○	○
... kufanele iveliswe nangezinye iilwimi	○	○	○	○	○

	SA	**A**	**NS**	**D**	**SD**
Ndingathetha ngeekhompyutha ndisebenzisa ulwimi lwam	○	○	○	○	○
ulwimi lwam kufuneka lusetyenziswe nangakumbi kwezemfundo ukucacisela abafundi izinto	○	○	○	○	○
Isigama sekhompyutha esingolwimi lwam kufanele sisetyenziswa, endaweni yesiNgesi	○	○	○	○	○

8) Ngokwezakho izimvo, zingaluncedo njani ezi zilandelayo, ukunceda abantu abathetha ulwimi lwakho ukuba bafunde ngeekhompyutha? (1 = akubalulekanga, 5 = kubalulekile kakhulu)

	1	**2**	**3**	**4**	**5**
I-software ebhalwe ngolwimi lwam	○	○	○	○	○
Iingcaciso ezishicilelweyo (zentetho) kunye nezifundo zevidiyo ngolwimi lwam	○	○	○	○	○
Ingcaciso magama (isichazi magama esincinane) yamagama esiNgesi anzima ehamba nenkcazelo ngolwimi lwam	○	○	○	○	○
Iincwadi namaphetshana akhutshwayo abhalwe ngolwimi lwam	○	○	○	○	○
Umntu onokufundisa ngeekhompyutha esebenzisa ulwimi lwam	○	○	○	○	○

Nika iimbono zakho:

9) Ukuba ulwimi lwakho belunokusetyenziswa (ndawonye nesiNgesi) ukufundisa ngeekhompyutha, zingambi kangakanani na ezingxaki?(1= akukho ngxaki, 5 = yingxaki enkulu)

	1	**2**	**3**	**4**	**5**
Iincwadana kunye namaphetshana abhalwe ngolwimi lwam kunganzima ukuziqonda	○	○	○	○	○
Kungaduru ukudala iincwadi nezinye izinto ezintsha ngolwimi lwam	○	○	○	○	○
Akukho abahlohli abanakho ukufundisa iikhompyutha ngolwimi lwam	○	○	○	○	○
Asikho isigama sekhompyutha ngolwimi lwam	○	○	○	○	○
Abafundi abayi kuba nakho ukufunda nokusebenzisa isiNgesi ngokwaneleyo	○	○	○	○	○
Abafundi abangaluthethiyo ulwimi lwam banganengxaki nalonto	○	○	○	○	○

Nika iimbono zakho:

10) Ungafumaneka nini ukwenza udliwano-ndlebe?

	ngoMvulo	**ngoLwesibini**	**ngoLwesithathu**	**ngoLwesine**	**ngoLwesihlanu**	**ngoMgqibelo**	**ngeCawe**
7:45 – 8:30		ISCM			Mat 1L		
8:40 - 9:25	Mat 1L	ISCM	ISCM	ISCM (A)			

9:35 - 10:20	CSC 1S (A)	Mat 1L	ISCM	ISCM (B)	CSC 1S (B)		
10:30 – 11:15	CSC 1S (A)		Mat 1L		CSC 1S (B)		
11:25 – 12:10	ISCM	CSC 1S / IL	CSC 1S / IL	Mat 1L	ISCM (A)		
12:20 – 13:05	ISCM	CSC 1S / IL	CSC 1S/ IL		ISCM (B)		
Lunch							
14:15 – 15:00	ISCM	ISCM	Mat 1L	CSC 1S (A)			
15:10 – 15:55	ISCM	ISCM	Mat 1L	CSC 1S (A)			
16:05 – 16:50	ISCM	ISCM		CSC 1S (B)			
17:00 – 17:45	ISCM	ISCM		CSC 1S (B)			
After							

Phambi kwangoLwesithathu umhla wama-24 ku-Oktobha **Nge-Swot week** **Emva-Swot week**

11) Ufuna ukuba wedwa xa kwenziwa udliwano-ndlebe, okanye ufuna ukuba nomnye umfundi?

Nceda ubhale iinkcukacha zakho (igama, inombolo yomnxeba, idilesi ye-imeyile)

Inombolo yefowuni : ..... **I-imeyile: .....**

12) Nceda ubhale iimbono zakho onokuzongeza ezizezinye

Appendix H: English - isiXhosa computer glossary (March 2007 version)

Nceda ubonise ukuba iluncedo kangakanani na ingcaciso magama enikiweyo (1 = asiloncedo konke, 5 = iluncedo kakhulu). Nika izimvo zakho kwisithuba esiphantsi kwengcaciso nganye. Izimvo zakho ziyakusinceda ekukhuliseni nasekuphuhliseni ngakumbi le ngcaciso magama.

A

Adjustment: [Utshintsho lolungelelwaniso] Ukutshintshwa kwakhona kwesicatshulwa ngokuhambelana nemida esele imiselwe.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**			**Ewe**

Izimvo zakho: _____

Alignment: [Ulungelelwaniso] Oku kubhekiselele ekubekweni kwamagama kwimida esele imiselwe. Zine iintlobo zolungelelwaniso ezithi zisetyenziswe. Zezi zilandelayo: Ulungelelwaniso lwasekhohlo, ulungelelwaniso lwasekunene, ulungelelwaniso lwaphakathi kunye nolungelelwaniso emgceni.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**			**Ewe**

Izimvo zakho: _____

ALU: [Iyunithi yokulawula] I-*ALU* imele u-*Arithmetic and Logic Unit*. I-ALU yinxenye yeCPU ethi ijongane nengqiqo nezobalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**			**Ewe**

Izimvo zakho: _____

Animation schemes: [Oopopayi] Xa ufuna umbhalo, imiqondiso okanye imifanekiso ishukume ngendlela ethile kwisilayidi sakho usebenzisa oopopayi. Umzekelo, oku ukwenza xa ufuna ukugqamisa umbhalo othetha ngawo, xa ufuna amagama atshone evela, njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**			**Ewe**

Izimvo zakho: _____

Application: [Inkqubo esetyenziswayo] Le yinkqubo yekhompyutha ejongana nomsebenzi othi ufakwe kwikhompyutha ukuncedisa abasebenzisi ukuba bakwazi ukuqhuba imisebenzi yabo ngempumelelo. Zimbini iintlobo zeenkqubo ezityenziswayo: yibespoke *application packages* kunye ne-off the shelf *application packages*.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**			**Ewe**

Izimvo zakho: _____

Array: [Izintlu zeeseli] Liqela leeseli ezimeleneyo. Liboniswa ngesiza seseeli ezimbini: ephezulu ekhohlo, nesezantsi ekunene. Ngenxa yoko isoloko imile ngokoxande.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Assembly language: [Iilwimi zendibanisela] Lulwimi olusetyenziswa yiyunithi yengqondo yekhompyutha. Lulwimi olusisiyaleli olufana nesikhompyutha kodwa lona lusebenzisa isimboli endaweni yebinary.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Attachment: [Isincamatheliso] Yifayili ethunyelwa ngokuncanyatheliswa kwi-imeyile. Xa ufaka ifayili kumyalezo kuye kuthiwe uyayincamathelisa okanye uyithumela njengesincamatheliso. Umzekelo ungathumela umfanekiso okanye ifayili njengesincamatheliso.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Average: [Umndilili/ i-avareji] Lubalo oluthi luquke iziphumo zamanani adityanisiweyo aze ahlulwe ngenani laloo manani adityanisiweyo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

B

Bespoke: [I*Bespoke*] Yinkqubo eyodwa ephuhliswe ngenjongo yokuphumeza umsebenzi owodwa kuba iinkqubo ezifumanekayo zingenako ukuwenza loo msebenzi.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Binary: [I*binary*] Lulwimi lwekhompyutha olwenziwe ngamanani (okanye amaqabane).

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Bit: Ngamanani u-1 kunye no-0.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Bold: [Ngqindilili] Amagama athi enziwe ngqindilili ngokucacileyo.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Bolding: [Ukwenza ngqindilili] Ibonakalisa ngokugqama amagama akhethiweyo, umzekelo: xa ufuna ukugqamisa isihloko sesincoko osibhalileyo, okanye amagama abalulekileyo kwizivakalisi zakho, ungawenza ngqindilili.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Bookmark: [Isalathisi sokugciniweyo] Sikwalathisa apho ugcine khona oko ubuthe wakutyumba ngaphambili.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Boolean: [I*boolean*] Isimeli-lutho esiyi*boolean* sibhekisele kuhlobo lwesimeli-lutho esingayinyani okanye ubuxoki, u-ewe okanye u-hayi. Umzekelo, xa ubuzwa le mibuzo: Ungummi woMzantsi Afrika? Utshatile? Uyindoda? Ungumfazi? Unabantwana? ungaphendula ngo-ewe okanye u-hayi qha.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Bullets: [Iimbumbulu] Zisetyenziswa kumaxwebhu nakwizilayidi ukudwelisa izinto njengakufakelo-manani, ntonje kufakelo-manani amanqaku ayalandelelana kodwa kwiimbumbulu amanqaku angalandelelana nakanjani na.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Byte: [I*byte*] Yingqokelela yee*bits* ezisibhozo, ezithi zenze i*byte* enye.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

C

Cell: [iseli] Ziibhokisana ezikwishiti yokusebenzela apho ufaka khona iinkcukacha xa ubhala. Ezi seli zicwangciswe kwimigca exwesileyo nehlayo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Cell address: [Isiza seseli] Indawo ngqo ekuyo iseli. Isiza siboniswa ngonobumba nenani apho unobumba amele umgca ohlayo ze inani limele umgca oxwesileyo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Chart: [Itshati] Ukuboniswa kweenkcukacha kusetyenziswa igrafu. Kukho itshati esisazinge, itshati enemigca netshati eneebhari.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Chip: [i*Chip*] Icwecwana elincinci elisebenza ngeesekethi. Umsebenzi walo kukucinga ngeenkcukacha ezithile.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Circuit: [i*Sekethi*] Ngumgaqo (ngokwesiqhelo iba lucingo) apho umbane uhamba khona. Iqela leesekethi zombane libizwa ngokuba yi*Circuitry*.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Click to add text: [Cofa apha ukufaka umbhalo] Yindawo apho ufaka khona umbhalo kwisilayidi sakho.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Click to add title: [Cofa apha ukufaka isihloko] Yindawo ocofa kuyo ukubhala isihloko sesilayidi sakho.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Client: [Umxhotyiswa] Yikhompyutha exhotyiswa ngumxhobisi ngokuthunyelelwa iinkonzo neenkcukacha. Umzekelo, umxhotyiswa angafumana amakhasi ewebhu, i-imeyile, iifayili, njalo njalo ezigcinwe kumxhobisi, okanye umxhotyiswa angasebenzisa umatshini wokushicilela oqhagamshelwe kumxhobisi.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Client/ server: [Umxhotyiswa-mxhobisi] Luhlobo lothungelwano apho iinkcukacha neenkonzo zithathwa zisuswe kumxhobisi omnye zisiwe kubaxhotyiswa abaninzi. Umzekelo, abaxhotyiswa abahlukileyo bafumana kumxhobisi ikhasi elinye lewebhu.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Clip Art: [I*Clip art*] Yingqokelela yemifanekiso ehamba nenkqubo yakwaMicr*osoft.* Ungayisebenzisa le mifanekiso kuxwebhu lwakho okanye kwisibonisi-ntetho.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

CMOS: [I*CMOS*] Yindawo kumqolo wekhompyutha apho kugcinwa izimeli-lutho zesixokelelwano kwiRAM engatshintshiyo. Ibhetri egcina iRAM engatshintshiyo isebenza naxa ikhompyutha icimile ukwenzela ukuba izimeli-lutho zingalahleki. Umzekelo wesimeli-lutho esingalahlekiyo xa ikhompyutha icimile lixesha kwiwotshi yekhompyutha.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Colour scheme: [Indibanisela yemibala] Ungazenza izilayidi zibukeke ngokufaka, umzekelo, umbala oluhlaza ngasemva, ze ifonti ibe tyheli.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Column: [Umgca ohlayo] Uludwe lwemigca ehlayo. Kukho iiseli ezisemigceni ehlayo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Conditional formatting: [Uhlenga-hlengiso oluhluzayo] Luhlenga-hlengiso oluhluza iiseli ngokweempawu ezichaziweyo. Umzekelo, ukuba uneshiti lokusebenzela kuxwebhu elinamanqaku abafundi, ungawahlenga-hlengisa amanqaku angaphantsi kwama-50% ngokuwafaka umbala obomvu.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Conditional sum: [Ubalo oluhluzayo] Uhlobo olulodwa lwesiphumo sobalo esihluza iiseli ngokweempawu ezichaziweyo.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Control unit: [Iyunithi yokulawula] Le yindawo ethi igcine, icazulule ze ikhuphe umyalelo ngamnye kwinkqubo yekhompyutha. Lilungu elibambekayo elithi lidlale indima yokuthumela iinkcukacha phakathi kwe*memory* kunye nezixhobo ezifakelwayo.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Copying: [Ukukopa] Ukukopa amagama okanye izicatshulwa kuxwebhu mhlawumbi ngenjongo yokuwancamathelisa kwenye indawo.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

CPU: [Ingqondo yekhompyutha] U-CPU umele u-Central Processing Unit. Yeyona ndawo yekhompyutha yenza umsebenzi wokucinga nokubala. I-*CPU* yingqondo yekhompyutha. Yeyona yunithi ibalulekileyo ukuqhubekisela phambili umsebenzi. Yenziwe yiyunithi yokulawula (Control Unit), yiyunithi yobalo nengqiqo(ALU), yiRAM kunye neROM.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Cutting: [Ukusika] Ukusika amagama okanye izicatshulwa kuxwebhu.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

D

Data: [Iinkcukacha ezigciniweyo] Ziinkcukacha, ezenzelwe ukuba zisetyenziswe kwikhompyutha. Zibandakanya amagama, amanani, izandi kunye nemifanekiso.

			1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Decimal alignment: [Ukulungelelanisa idesimali] Ukubeka izintlu ezehlayo zamanani namanqaku edesimali alungelelaniswe ngokwehlayo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Default: [Uselekho] Oko ukufumana sele kukhona xa ungekakhethi okunye. Umzekelo, umbhalo owufumana sele ukhona ngu*Times New* Rom*an*, ubungakanani bombhalo ibe ngu-12, njalo njalo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Deletion: [Ukucima] Ukucima esikrinini amagama, imifanekiso okanye amaxwebhu akwizigcini-nkcukacha zekhompyutha.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Directory: [Isigcini seefayili] Isixhobo esisetyenziselwa ukugcina iifayili neziqulathi-fayili kwikhompyutha.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Discretionary hyphenation: [Ufakelo-khonkco] Ukufaka ikhonkco ukwahlula igama elingoneliyo emgceni ukuze ligqibezeleke kumgca olandelayo.

Um-
zekelo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Disk drive: [Isigcini-nkcukacha esingundoqo] Sibonisa iindawo ezizizigcini-nkcukacha.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Document window: [Indawo yokubhala kuxwebhu] Yindawo emhlophe, kwifestile, eyenzelwe ukubhala.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Drawing: [Umzobo].

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Driver: [Isiqhubi] Sisixhobo esingabambekiyo esiyimfuneko ukuqhubela phambili umsebenzi wesixhobo esibambekayo. Umzekelo, xa uthenga umatshini wokushicilela ukwafumana necwecwe elineziqhubi neencwadana ezisisikhokelo, njalo njalo. Ungafaka isiqhubi ngomvumisi.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

E

Email: [I-imeyile] Luhlobo lweleta okanye umyalezo othi uthunyelwe ukusuka kumsebenzisi ukuya komnye. Isetyenziswa kwi-Intanethi yaye ngenxa yeso sizathu iyakhawuleza ukufika apho ithunyelwa khona. Uyithumela i-imeyile kwidilesi yomamkeli-imeyile. Ungafaka isincamatheliso kwi-imeyile oyithumelayo. Umzekelo we-imeyile ngu*hotmail*, u*gmail,* njalo njalo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

End mark: [Uphawu lwesiphelo] Umgca obonakalisa isiphelo soxwebhu. Awufumaneki ngawo onke amaxesha kwifestile yoxwebhu.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Excel: [U-*Excel*] Yinkqubo esetyenziswa ukuhlenga-hlengisa iinkcukacha ngokwezicwangciso ezimiselweyo. Iinkcukacha zingafakwa kwimigca exwesileyo nakwehlayo. Le nkqubo ifuna ubuncinane umthamo ongange-2. 5MB kwisigcini-nkcukacha esingundoqo. Kwis*preadsheet*, uxwebhu lwes*preadsheet* lwenziwe ngamashiti okusebenzela adla ngokuba mathathu kodwa ungawongeza xa kuyimfuneko.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

F

Find: [Fumana] Ukufumana igama elikhankanyiweyo ngokukhawuleza kuxwebhu.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Flash stick: [Umcinga osisigcini-nkcukacha] Sisixhobo esifakelwayo sokugcina iinkcukacha. Ngumcinga omncinci ongawugcina kuwe xa ufuna. Mncinci ngembonakalo kodwa unako ukugcina iifayili ezinomthamo omkhulu ngokokuxhomekeke kubungakanani bawo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Folder: [Isiqulathi seefayili].

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Font: [Umbhalo] Umbhalo ungantlobo-ntlobo. Umzekelo, *Times New* Roman, *Arial*, *Verdana*, njalo njalo. Unganobungakanani obahlukileyo, umzekelo: 12, 14, 15. 5, 28, njalo njalo. Umbhalo ungangqindili, *ungakekela*, ungakrwelelwa, njalo njalo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Footer: [Unyawo-phepha] Ngamagama enziwa ngumsebenzisi athi azivelele kumazantsi ephepha ngalinye kuxwebhu kodwa awayonxalenye yokubhalwe kuxwebhu.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Footnoting: [Umbhalo-ngcaciso emazantsi] Ngamanqaku aqatshelwe ngamanani okanye ngoonobumba kuxwebhu nathi anike inkcazelo yento ethile kwindawo elikuyo elo nani okanye loo nobumba. Afumaneka kumazantsi ephepha elikulo elo nani okanye loo nobumba.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Format: [hlenga-hlengisa].

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Formula: [Isichankcathi esiqingqiweyo/ ifomyula] Yimiyalelo oyisebenzisa ukufumana iziphumo ezithile. Oko ukufakayo wena ngokwakho kwisichankcathi kungatshintsha ngokuxhomekeke kwiziphumo ozifunayo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Function: [Icebo] Oko kuthile ukwenza kwiinkcukacha, umzekelo: xa ubala i-avareji.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

H

Hardware: [I*hardware*] I*hardware* iquka onke amalungu ekhompyutha abambekayo. I*hardware* iyafana nesiqu somntu. Kululutho ukuba ikhompyutha ibe nesoftware ukwenzela ukuba ikwazi ukusebenzisa i-hardware. Siinendidi ezine ze-hardware ezifunekayo ukwenzela ukuba ikhompyutha isebenze, ezizezi izifaki-nkcukacha (input device*s*), izikhuphi-nkcukacha (*output devices*), izigcini-nkcukacha (storage devices), neyunithi yengqondo yekhompyutha (*Central Processing Unit* - CPU).

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Header: [Intloko-phepha] Ngamagama enziwa ngumsebenzisi athi azivelele emantla ephepha ngalinye kuxwebhu kodwa awayonxalenye yokubhalwe kuxwebhu.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

High-level language: [Lulwimi lokuqhuba iinkqubo zekhompyutha ezikumgangatho ophezulu] Xa sisebenzisa iilwimi ezikumgangatho ophakamileyo, umyalelo ungaguqulelwa kwelinye iqela lemiyalelo ngesikhompyutha. Umzekelo: xa unika umyalelo othi, "yenza iti", umntu uyazi ukuba makabilise amanzi, akhuphe iikomityi, afake iti kuzo alinde amanzi abile. Akubila amanzi, awagalele ekomityini.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Hyperlink: [Isalathisi] Ngamagama adla ngokuba zuba ngombala, aze akrwelelwe umgca ngaphantsi. Xa uwacofa akuthumela kwifayili ethile, indawo ethile kwifayili okanye kwikhasi elithile loxwebhu kwi-intanethi.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

I

Icon: [Uphawu] Ngumfanekiso odla ngokuba mncinci othi xa ucofa kuwo ukukhombe kwenye indawo (umz: isigcini-fayili), kwenye into (umz: ifayili) okanye komawukwenze (umz: faka imbono).

	1	2	3	4	5

Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Indent: [Ushenxiso] Ukumiselwa kwemida yethutyana ngokuthi kubuyiselwe nganeno umgca okanye isicatshulwa ngokwahlukileyo kwimida esele imiselwe.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Input device: [Izifaki-nkcukacha (kwikhompyutha)] Ezi zizixhobo ezifakwa kwikhompyutha ukwenzela ukufaka iinkcukacha.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Insertion: [Ufakelo] Ukufakela amagama amatsha ungakhange ube kanti uwacimile ebekhona kakade.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Insertion point: [Indawo yokufakela oonobumba namanani] Ngumgcana omileyo nkqo, odanyazayo esikrinini, ochaza indawo apho unokubhala khona amagama.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Internet: [I-Intanethi] Luthungelwano olunxibelelanisa iikhompyutha ehlabathini jikelele. Isebenzisa ulwimi i*TCP/IP* ukugqithisela iifayili, amaxwebhu neenkcukacha phakathi kwabaxhobisi nabaxhotyiswa okanye phakathi kweekhompyutha kuthungelwano lomlingane kumlingane. Yaqala kwi-*ARPAnet* phakathi kweekhompyutha ezine kumkhosi waseMelika koo-1960. Yanda yanxibelelanisa iikhompyutha eziyunivesithi, koorhulumente, ezikolweni, kumashishini naphakathi kwabantu. Ngoku inxibelelanisa abantu abangaphezu kwezigidi ezili-150. Abantu bangafumana amakhasi ewebhu kubaxhobisi.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

ISP: [Umnikeli we-intanethi] U-*ISP*, umele u-Internet Service Provider. Lishishini okanye inkampani enikela nge-intanethi. Umzekelo, ukuba ufuna ukufumana i-intanethi ekhayeni lakho kufuneka uhlawule imali ku*Telkom,* u*Telnet,* u*Polka,* u*Syba*web, njalo njalo.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Italics: [Isikekelisi-magama] Kukwenza amagama ukuba abhaleke ngokukekeleyo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

J

Justification: [Ulungelelwaniso emgceni] Luhlobo lolungelelwaniso apho amagama enziwe ukuba azalise umgca.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

K

Keyboard: [isichwethezi] Esi sesona sixhobo sixhaphakileyo sokufaka iinkcukacha ekhompyutheni, ikwa sesona sixhobo silula ukusisebenzisa kwikhompyutha.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

L

Light pen: [Ipeni yokukhanyisa] Sisifaki-nkcukacha esifana nepeni kodwa sona asisebenzisi inki, endaweni ye-inki sisebenzisa ukukhanya. Esi sifaki-nkcukacha asisebenzi kuso nasiphi na isikrini.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Line spacing: [Isithuba phakathi kwemigca] Oku kubhekiselele kubungakanani besithuba esiphakathi kwemigca.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

M

Machine language: [Isikhompyutha] Lulwimi lwekhompyutha oluyingqokelela yamaqabane u-0 no-1 angamaqela esi-8. Ngesikhompyutha ii*bits* ziyafana noonobumba namanani, ze zona ii*bytes* zifane namagama.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Mail client: [Umlawuli-posi] Yinkqubo esetyenziswa ukulawula i-imeyile. Yinkqubo ethile eyahlukileyo kwiinkqubo zokulawula ii-imeyile kwiwebhu ezikwisikhangeli-webhu.

Umzekelo ngu-*Outlook Express*, u*Microsoft Outlook*, u*Mozilla Thunderbird,* u*Pegasus,* njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Mail merge: [Iposi kawonke-wonke] Yimbalelwano efanayo enokuthunyelwa kubantu abaninzi abahlukeneyo. Umzekelo: xa ivenkile efana no*Truworths* ibhengeza amaxabiso aphantsi iye ibhalele bonke abaxhasi bayo ileta enye kodwa ngeedilesi zabo ezahlukeneyo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Mail server: [Umxhobisi we-imeyile] Umxhobisi olawula i-imeyile. Uthumela, ukhusela, agcine i-imeyile yakho, njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Median: [Inani elisembindini] Xa kudweliswe amanani ukususela kwelikhulu ukuya kwelincinci, leli lona lisembindini.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Menu bar: [Umgca woluhlu] Luluhlu ongakhetha kulo ukusebenzisa uxwebhu lwakho. Lusoloko lusemantla esikrini.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

MICR: [IMICR] i*Magnetic Ink Character Recognition* (MICR) sisifaki-nkcukacha esikwaziyo ukufunda okubhaliweyo nge-inki yemagnethi. Esi sixhobo amaxesha amaninzi sisetyenziswa ziindawo ezifana neevenkile ukuphonononga amaxabiso. Evenkileni uya nento oyithengayo ethilini, umsebenzi usikena i*barcode* ethi iveze lo nto uyithengayo nexabiso layo esikrinini.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Motherboard: [Umqolo wekhompyutha] Sisixhobo esiqhagamshela ingqondo yekhompyutha nezixhobo ezifakelwayo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**		

Izimvo zakho: _____

Mouse: [Impuku] Sisifaki-nkcukacha esisetyenziswa ukwalatha, ukukhetha, ukuvula amaxwebhu, njalo njalo esikrinini.

		1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

N

Navigation bar: [Umgca wendawo]

		1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Normal view: [Imbonakalo yesiqhelo] Ibonisa isilayidi esinye qha.

		1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Numbering: [Ufakelo-manani] Ukufaka amanani, oonobumba okanye amanani esiRoma xa udwelisa izinto xa ubhala kuxwebhu lwakho. Ungasebenzisa neembumbulu ukudwelisa izinto.

		1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

O

Off the shelf: [Uhlobo lwenkqubo oyifumana sele ilungile] Uninzi lwabantu basebenzisa ezi nkqubo kwiikhompyutha zabo. Ezi ziinkqubo zekhompyutha ezenziwe zaneenjongo eziphangaleleyo.

		1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Operating system: [Isixokelelwano sokuqhuba umsebenzi ekhompyutheni] Isixokelelwano sokuqhuba umsebenzi siyeyona nto ingundoqo eyenza ukuba ikhompyutha isebenze. Wonke umsebenzi udinga esi sixokelelwano ukuqhuba ezinye iinkqubo. Izixokelelwano zokuqhuba umsebenzi zenza imisebenzi efana nale ilandelayo:
ukuqonda iinkcukacha ezifakwe ngesichwethezi sekhompyutha.
ukuthumela iinkcukacha kwisikrini.
ukulawula iifayile nezixhobo zokugcina iifayile ekhompyutheni.
ukulawula izixhobo ezifakelwe ekhompyutheni ezifana namacwecwe nemicinga yokugcina iinkcukacha kunye noomatshini bokushicilela.

ziba noxanduva lokujongana nokhuseleko, ukuqinisekisa ukuba abangenalungelo abafikeleli ngokutyhoboza kumsebenzi ongengowabo.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Outline view: [Imbonakalo engumgqabazo] Ibonisa umbhalo wezilayidi zonke ngokudwelileyo.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Output devices: [Izikhuphi-nkcukacha] Ezi zizixhobo zokukhupha okanye ukubonakalisa iinkcukacha ezigcinwe okanye ezivela ekhompyutheni. Umzekelo: isikrini, izikhuphi-sandi, umatshini wokushicilela, nezinye.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Over striking: [Isisusi-magama] Ukususa amagama asele ekhona ngokubhala phezu kwawo ungakhange usebenzise isixhobo sokucima.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

P

Page numbering: [Ufakelo-nani kwikhasi] Ukufakela inani kwiphepha okanye amaphepha ngokulandelelana, ukubonisa ukuba iphepha ngalinye lelesingaphi na kuxwebhu lwakho.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Pagination: [Udalo-phepha] Ukwahlulwa koxwebhu lube ngamakhasi ahlukeneyo.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Peer to peer: [Umlingane kumlingane] Uhlobo lothungelwano apho iikhompyutha zisebenza ngokulinganayo. Oku kuthetha ukuba zingabaxhobisi ze kwangaxesha nye zibe ngabaxhotyiswa. Xa ninaniselana ngomculo nisebenzisa i*DC*++ ungadontsa umculo kuyo nayiphi na ikhompyutha ekuthungelwano lomlingane kumlingane. Nezinye iikhompyutha zingadontsa umculo kuwe.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Picture: [Umfanekiso].

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Processor speed: [Isantya sengqondo yekhompyutha] Sisantya esebenza ngaso ingqondo yekhompyutha. Umlinganiselo waso uthathwa ngee*MegaHertz*.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Programming language: [Ulwimi olusisiyaleli] Asilolwimi lwamntu, kwaye ingelolwimi lwakhompyutha kodwa lulwimi ikhompyutha eluqondayo. Xa uthetha nesilwanyana esifana nenja, uyasinika imiyalelo siyilandele imiyalelo yakho. Olu lwimi kufuneka luthi ngqo, lucace gca kungenjalo imiyalelo engacacanga ingayilahlekisa ikhompyutha. Umzekelo wezi lwimi yi*HTML*, isi*Python*, isiJava nezinye.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Protocol: [I*Protocol*] Lulwimi olusetyenziswa ziikhompyutha ukuzinceda zikwazi ukuthumelelana iinkcukacha kwi-Intanethi. Ngokokubhekisele kubuchwepheshe, yingcaciso yemigaqo nemiqathango iikhompyutha ezimbini ekufanele ziyilandele ukwenzela ukuba zikwazi ukuthumelelana imiyalezo. Imizekelo yee*protocol* yile: yi*HTTP*, i*FTP*, i*SMTP*, i-*IMAP*, i*POP3*, i*TCP/IP*, njalo njalo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

R

RAM: [IRAM (i-*Random Access Memory*)] Ngamacwecwe agcina ulwazi okwethutyana ngexesha usebenza ekhompyutheni. La macwecwe asebenza kuphela xa ikhompyutha ilayitile, yiyo loo nto kubalulekile ukuba uwulondoloze umsebenzi wakho kwisigcini-nkcukacha phambi kokuba uyicime ikhompyutha yakho.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Recipient: [Umamkeli-imeyile] Idilesi efumana okanye eyamkela i-imeyile.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Replace: [Tshintsha] Ukutshintsha amagama akhankanyiweyo ngalawo anikiweyo ukuba atshintshwe ngawo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

ROM: [IROM] Ziinkcukacha eza sele inazo ikhompyutha futhi ezisebenza ukunika ulwazi ngobuqu bekhompyutha leyo, umzekelo: umthamo wekhompyutha. Umsebenzisi-khompyutha akanakho ukuzitshintsha ezi nkcukacha.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Row: [Umgca oxwesileyo] Uludwe lwemigca exwesileyo. Kukho iiseli ezisemigceni exwesileyo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Ruler: [Umgca-manani] Yimigca enamanani entla kwefestile nasekhohlo lefestile yoxwebhu.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

S

Scroll bars: [Imigca yokunyuka usihla] Yimigca oyisebenzisa ukuhla unyuka kuxwebhu ngenjongo yokubonakalisa iziqendu ezahlukeneyo kulo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Search engine: [Inkqubo esetyenziswa kwiwebhu] Yinkqubo esetyenziswa kwiwebhu ukukhangela iinkcukacha kwi-intanethi, nokukhangela iziza zewebhu. Umzekelo, u*google,* u-*ananzi,* u*yahoo,* njalo njalo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Sender: [Umthumeli-imeyile] Idilesi evela kuyo i-imeyile.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Server: [Umxhobisi] Yikhompyutha exhobisa ezinye iikhompyutha ngokuzithumelela iinkonzo okanye iinkcukacha. Umzekelo, isixhobisi sewebhu sithumela amakhasi ewebhu nge*HTTP*.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Service provider: [Umnikeli-nkonzo] Lishishini okanye inkampani ebonelela ngeenkonzo kwi-intanethi. Umzekelo, inkampani esingatha iziza zewebhu, iinkampani ezinikela iinkonzo ze-imeyile njengo*hotmail,* u*gmail,* u*webmail,*** **njalo njalo.**

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Size: [Ubungakanani] Bukuchazela ukuba zinkulu kangakanani na izigcini-nkcukacha kwakunye neefayili ezikuzo. Umlinganiselo wazo ungokweebyte*s*. Iibyte*s* zingabekwa ngokwamaqela ee*kilo*byte*s (kb),* ee*mega*byte*s,* ee*giga*byte*s,* nee*tera*byte*s*.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Slide: [Isilayidi] Likhasi kwisibonisi-ntetho elisebenza ngokufanayo nekhasi kuxwebhu. Ulibonisa eludongeni okanye ebhodini ze ubhekise kulo xa usenza intetho.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Slide design: [Uyilo lwesilayidi] Ukuyilwa okanye ukudalwa kwekhasi lesilayidi. Umzekelo ungakhetha imibala, isimo sesilayidi, njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Slide layout: [Isimo sesilayidi] Lulungelelwaniso lwebhloko yamagama, izihloko kwakunye nemifanekiso kwisilayidi.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Slide pane: [Indawo yezilayidi] Yindawo ekhohlo kwesilayidi apho zidweliswa khona zonke izilayidi ngokulandelelana.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Slide show view: [Umboniso wesilayidi] Ukuboniswa kwezilayidi ebantwini xa uthetha.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Slide sorter view: [Isihlela-hleli sesilayidi] Sibonisa zonke izilayidi ngaxeshanye ukwenzela ukuba ube nako ukuzihlela-hlela xa kuyimfuneko.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Slide Transition: [Ukuguqulwa kwesilayidi] Isimbo esithi siboniswe sisilayidi xa kugqithelwa kwesinye. Umzekelo, xa isilayidi sijika sibe mnyama esazulwini okanye xa isilayidi siphuma ekunene esilandelayo singena ekhohlo.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Software: [Izixhobo ezingabambekiyo zekhompyutha] Ezi zizixhobo (okanye iinkqubo) zekhompyutha ezingabambekiyo ngesandla. Is*oftware* ekhompyutheni ifana nolwazi lomntu lokwenza izinto (umzekelo iziphiwo zomntu). Iikhompyutha ziyakwazi ukufunda ukwenza izinto emacwecweni njengokuba abantu befunda ezincwadini. Le yinto eyenzekayo xa ufakela izixhobo ezingabambekiyo ekhompyutheni: uyayixelela ukuba mayiqhube njani. Sineendidi ezintathu zezixhobo zekhompyutha ezingabambekiyo ezibangela ukuba ikhompyutha isebenze kakuhle. Ezi ndidi nazi: izixhobo ezingabambekiyo zesixokelelwano sekhompyutha, izixhobo ezingabambekiyo zenkqubo esetyenziswayo, kunye nolwimi olusisiyaleli.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Spell checker: [Uhlolo-pelo] Isixhobo esithelekisa upelo lwamagama akwisicatshulwa nalawo akwisichazi-magama ze ukuba sibona iimpazamo, sinike iingcebiso.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Standard deviation: [I*Standard deviation*] Umgama oyi-avareji (umndilili*)*, ngokwezibalo, phakathi kwamanani aliqela kunye ne-avareji (umndilili) yaloo manani.

	1	2	3	4	5
Ingaba le ngcaciso iluncedo? **Hayi**	O	O	O	O	O **Ewe**

Izimvo zakho: _____

Status bar: [Umgca wesimo] Uchaza iinkcukacha zoxwebhu apho ikhoyo indawo yofakelo lwamagama.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Storage devices: [Izigcini-nkcukacha] Ezi zizixhobo zokugcina iinkcukacha ezininzi ekhompyutheni. Umzekelo: isigcini-nkcukacha esingundoqo (*hard disk*).

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Sum: [Isiphumo sobalo] Sisiphumo sobalo lwamanani adityanisiweyo.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Super-Calc: [I*Super-Calc*] Yinkqubo ye*spreadsheet* engaxhomanga ngomgangatho. Isebenzisa ifayili yenkqubo ye*spreadsheet* yakudala njengo*Lotus 1-2-3*. Nangona ingaxhomanga ngomgangatho inako ukuvula ifayili kuLotus 1-2-3, nee*Macros* de ivule ukuya kwisithathu samashiti okusebenzela.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

System clock: [Iwotshi yekhompyutha] Yiwotshi yekhompyutha engaphakathi egcina ixesha. Inebhetri egcina ixesha xa ikhompyutha icimile.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

System software: [Isixhobo esingabambekiyo sesixokelelwano sekhompyutha] Ezi ziinkqubo zekhompyutha ezibangela ukuba ikhompyutha isebenze. Zindidi-mbini, ezizezi: isixokelelwano sokuqhuba umsebenzi kunye neenkqubo eziluncedo ekhompyutheni. Ikhompyutha isebenzisa esi sixokelelwano ukwenzela ukuqhuba nezinye iinkqubo zayo.

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

T

Table: [Isicwangcisi-nkcukacha] Iqoqosha iinkcukacha ngokuzifakela ngokoluhlu oluhlayo noluxwesayo. Ukuba uneenkcukacha ezininzi kufuneka usebenzise i*spreadsheet.*

		1	2	3	4	5	
Ingaba le ngcaciso iluncedo? **Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**

Izimvo zakho: _____

Task pane: [Indawo yemisebenzi] Yindawo esekunene kwisilayidi apho ungakhetha khona izinto ngezinto onokuzisebenzisa kwisilayidi, umzekelo: oopopayi, umfuziselo, isimo sesilayidi, njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Template: [Umfuziselo] Ngumzekelo owukhethayo othi xa uwusebenzisa kuxwebhu okanye kwisilayidi sakho zithi zifane nawo. Ukuba usebenzisa umfuziselo owukhethileyo, umzekelo kumboniso wezilayidi, zonke izilayidi zithatha umbala nohlenga-hlengiso lwaloo mfuziselo uwukhethileyo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Title bar: [Umgca wesihloko] Ngumgca osentla kwefestile yoxwebhu odla ngokuba nombala obhlowu/ozuba obonisa igama lefayili.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Toolbar: [Umgca wezixhobo] Ngumgca obonisa izixhobo zomsebenzi ofana nale ilandelayo: Sika, Gcina, Kopa, Ncamathisela, njalo njalo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Touch screen: [Isikrini esicofwayo] Esi sisifaki-nkcukacha esibangela ukuba ukwazi ukusebenzisa ikhompyutha ngokucofa isikrini endaweni yokusebenzisa isichwethezi sekhompyutha. Umzekelo: abanye oomatshini bangaphandle ebhankini, ezinye iithili evenkileni, njalo njalo. Basebenzisa isikrini esicofwayo.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

U

Underlining: [Ukukrwelela umgca] Eli ibinzana liyawuchaza ngokucacileyo umsebenzi wesi sixhobo. Umzekelo, ungakrwelela amagama abalulekileyo okanye ukrwelele isihloko sesincoko sakho.

			1	2	3	4	5	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

URL: [I-*URL*] Isiza esisodwa kwi-intanethi. Umzekelo xa ufumana isalathisi nge-imeyile, xa usicofa siya kukusa ngqo kwisiza esisodwa kwi-intanethi selo khasi lewebhu okanye saloo fayili.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Utility program: [Inkqubo eluncedo] Ezi ziinkqubo zekhompyutha ezenza imisebenzi engantsonkothanga. Le ilandelayo yeminye yale misebenzi: ukhuselo lwegama lokugqitha, ukulawula iingcinga zekhompyutha, ukukhusela ikhompyutha kwintsholongwane nokucutha iifayili njalo njalo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

V

Variable: [Isimeli-lutho] Linani okanye unobumba omele into enokutshintsha. Isimeli-lutho singantlobo-ntlobo: ingalinani, umbhalo, oonobumba, umhla, ixesha, isimeli-lutho esiyiboolean, njalo njalo. Umzekelo: ubungakanani beminyaka = 45, igama = Siphokazi, umhla = 26/03/2007, esiyiboolean = Ungummi woMzantsi Afrika = ewe okanye hayi, njalo njalo.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

View: [Imbonakalo] Indlela okubonakala ngayo okuqulathwe sisilayidi. Imizekelo yeembonakalo yile ilandelayo: imbonakalo yesiqhelo, imbonakalo engumgqabazo, umboniso wesilayidi nesihlela-hleli sesilayidi.

			1	**2**	**3**	**4**	**5**	
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Virus: [Intsholongwane] Ezi ziinkqubo zekhompyutha ezithi zibangele ukungalawuleki okanye ukonakala kwiinkqubo zeekhompyutha. Ezinye ziyaziphinda-phinda zenze inani eliphakamileyo zibangele ukuba ezinye iinkqubo zekhompyutha zingasebenzi ngendlela efanelekileyo. Ezi zilandelayo zezinye zeempawu zekhompyutha enentsholongwane:
xa ubona umyalezo ongaqhelekanga okanye umfanekiso ovezwe ekhompyutheni yakho.
isandi esingaqhelekanga okanye umculo odlala isidala ekhompyutheni yakho.
xa ingcinga yekhompyutha ekhoyo ingaphantsi kwale uyaziyo.
xa kukho inkqubo yekhompyutha okanye ifayili elahlekileyo.
ubungakanani befayile butshintsha ngaphandle kwenkcazelo
iifayile neenkqubo azisebenzi ngokwesiqhelo.

	1	**2**	**3**	**4**	**5**

Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

W

Web: [IWebhu (*WWW*)] U-*WWW*, omele u*World Wide Web*, luthungelwano lwabaxhobisi olusebenzisa ulwimi olufanayo ukuthumelelana amaxwebhu njengamakhasi ewebhu kunye neefayili. Eli gama lidla ngokusetyenziswa ukubhekisela kwingqokelela yamaxwebhu.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Web browser: [Isikhangeli-webhu] Yinkqubo esetyenziswa ngumsebenzisi-khompyutha ukufumana amakhasi ewebhu neefayili ezigcinwe kubaxhobisi. Imizekelo yezikhangeli-webhu yi-Internet *Explorer*, i*Mozilla Firefox*, i-*Opera*, njalo njalo.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Web Design: [Uyilo lwewebhu] Ukudalwa okanye ukuyilwa kweziza namakhasi ewebhu.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Window: [Ifestile] Kulapho inkqubo esetyenziswayo ikhoyo. Inomgca wesihloko phezulu. Ungayinciphisa, uyandise okanye uyivale, usebenzisa iibhokisi ezintathu ezingentla ekunene.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Wizard: [Umvumisi] Sisixhobo esingabambekiyo osisebenzisa ukufaka okanye ukulungisa ezinye izixhobo ezingabambekiyo. Sikubuza imibuzo ngemibuzo ukwenza oku.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Word Art: [I*Word Art*] Yindlela yokulungelelanisa umbhalo ubukeke. Isetyenziswa ikakhulu ukubhala izibhengezo ingakumbi iintengiso.

1 2 3 4 5
Ingaba le ngcaciso iluncedo? **Hayi O O O O O Ewe**
Izimvo zakho: _____

Word processing: [Ukubhala kuxwebhu] Oku kuquka ukuchwetheza kuxwebhu, ukuhlelwa kwamagama, ulungelelwaniso, ukutshintsha, ukukopa, ukuncamathisela, uhlolo-pelo, njalo njalo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Word wrapping: [Ukuqhubeka kwamagama ekupheleni komgca] Kuyazenzekela ukuba kuthi xa ufika esiphelweni somgca igama elilandelayo liziyele kumgca olandelayo.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Workbook: [Luxwebhu lwe*spreadsheet*] Ungaluthelekisa noxwebhu kwinkqubo yokubhala.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Worksheet: [Ishiti lokusebenzela] Lishiti kuxwebhu lwe*spreadsheet*. Adla ngokuba ngamashiti amathathu kodwa ungawongeza xa kuyimfuneko.

			1	**2**	**3**	**4**	**5**
Ingaba le ngcaciso iluncedo?	**Hayi**	**O**	**O**	**O**	**O**	**Ewe**	

Izimvo zakho: _____

Nceda wongeze amagama ocinga ukuba kuyimfuneko ukuba afakwe kule ngcaciso-magama.

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Ezinye izimvo:

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Appendix I: Example of translate@thon transcription

Pamela: I think masiqale sibuze ukuba yintoni umsebenzi kaExcell? What is the primary function kaExcell?

Lorenzo: It is to organise Data. It is a book of tables. We've got tables all collected like a book. A workbook has got several worksheets.

Pamela: A book has got several worksheets.

Lorenzo: A worksheet is what you see is the one with the cells and that's a table. It's a table in which you can do various operations, you can move things around, create links within the various cells.

Pamela: So the first primary thing is a programme to organise data. OK.*Uku-organayiza* is like orderly way of organising, isn't it?

Lorenzo: Yes.

Pamela: So, how can we capture...?

Lorenzo: Let's think one second because the next thing is gonna be database, a database is also used to organise data although it's mostly used to store data. Essentially, a database is also using a collection of tables but in a different way. It's more advanced.

Pamela: Have'nt we got a database somewhere?

Lorenzo: No not yet, we came across it ...

Pamela: We've got i-data, we came across it somewhere... Yintoni u-uvimba? Besithe yintoni uvimba kanene?

Other people: Yi-database

Pamela: OK, so if we starting with database, it would be uvimba ogcina iinkcukacha in an organised way.

Lorenzo: Yes, I was just mentioning because it's on our way and so we must bare it on mind to use a term/definition that is not gonna be confusing when we come to databases. Basically what the spreadsheet does is that, it organises data into tables.

Pamela: Into tables? What is to organise, *lo* organise ndimfunayo not uququzelela kind of. Is it not? Akokuhlela*?*

Thandeka: Ukuhlenga-hlengisa

Pamela: Ukuhlenga-hlengisa okanye ukuhlela, ukuhlela iza kubangathi kuku-editha. Ukuhlenga-hlengisa iinkcukacha ngokweethebhula. Kuthwa ziintoni iitables? Ziithebhula?

Rushman: Ziitafile

Other people: hayi maan!

Rushman: Table...

Nomathemba: Ayiloluhlu?

Pamela: Uluhlu is a list nhe, so in a table you have a list, uluhlu nhe. Inkqubo esetyenziswa ukuhlengahlengisa iinkcukacha kwiitheyibhula. What are tables?? Ayizo theyibhula?

Lorenzo: (from the background) Is there a suggestion?

Msindisi: (from the background)Should we search for it?

Lorenzo: (from the background) Yes

Rushman: Ndifun' ukunqonda le theyibhule athetha ngayo ekhomyutheni yinto enjani?

Thandeka: Phaya ku-Excell kukho izinto ezingathi ziibloko ezinje ekufakwa kuzo i-information zibene...

Rushman: Masisebenzise eli gama mos ulibizayo, asinakuthi ziitafile.

Pamela: Let's say sonke sizistudents zehonours, iza kubanguMapi... let us say iza kubanguDalvit when we arranging it alphabetically. Sibhala ii-assignments eziyi-4 kweny' ilisti kukho amagama ethu kwenye ilisti kuno-assingment1 neemarks zethu, assignment2... kuthwe i-assignment zikhawunta u-50% so i-excell iyakwazi ukukhatyulethi u-50% yeemarks zakho...

Rushman: Izifake kwezaatables?

Pamela: Yes, you put ifomula ikhatyulethi ezaa marks zonke. So that is umsebenzi wayo, hence sisithi isetyenziswa ukuhlenga-hlengisa iinkcukacha ezifakwe kwitheyibhula.

Rushman: Masisebenzise eli gama lithi theyibhula.

Pamela: Sithi theyibhula?

Rushman: Yes.

Pamela: Inkqubo esetyenziswa ukuhlenga-hlengisa iinkcukacha kwitheyibhula... ummmh andiyiqondi kakuhle.

Rushman: Asilocwecwe?

Pamela: Ayilocwecwe, izintlu ziintoni?

Rushman: Ayiloluhlu?

Pamela: Yiplural yoluhlu nhe.

Rushman: Izintlu zizinto ezidiviyidiweyo ezahlukeneyo, uyakhumbula sithetha kulaa lecture ngento yezintlu mbini. Uyakhumbula?

Pamela: To part?

Rushman: Yha, it's like ukudivida into into numbers.

Pamela: mmh, ndimamele

Nomathemba: Izicwangciso

Rushman: Itheyibhula sisicwagciso?

Pamela: Isicwangciso manani yitime table

Rushman: sisicwangciso-manani, yes

Pamela: Inkqubo esetyenziswa ukuhlenga-hlengisa iinkcukacha ngokwezicwangciso... what is another word for isicwagciso? Is it plan isicwangciso?

Rushman: yes yiplan isicwangciso. Ezaa tables azicwangciswanga zona kwikhompyutha?

Other people: Zicwangcisiwe

Rushman: ... ngokwezicwangciso zekhompyutha.

Pamela: Inkqubo esetyenziswa ukuhlengahlengisa iinkcukacha ngokwezicwangciso ezimisiweyo. According to the tables that have been set?

Rushman: Ukubangabana zimiselekile pha kwikhompyutha, mhlawumbi masithi...

Thandeka: Zicwangisiwe and i-information eza kufakwa phaya fits in kwesasicwangciso.

Pamela: Yha yha, there's no... Ngokwezicwangciso ezimiselweyo nhe... Iinkcukacha ngokwezzicwangciso ezimiselweyo. The first part Msindisi nhe... inkqubo ezi...

Msindisi: uxolo nje kancinci... OK mandiyibhale le...

Pamela: Inkqubo esetyenziswa ukuhlenga-hlengisa iinkcukacha ngokwezicwangciso ezimiselweyo. OK, fullstop so far...

Nomathemba: Laa inkqubo ayingo-i-n-k-q...

Pamela: Yes

Nomathemba: Ingathi uthe inqubo...
Pamela: Hayi uyibhale kakuhle..
Nomathemba: OK ndiyayibona
Pamela: Is it important that you put the size phaya...?
Rushman: 2.5 Megabytes
Pamela: Wazi neemegabytes uMoneli...
Everyone: (laughing)
Msindisi: Yenzelwe iinkcukacha onokuzigcina ukwazi ukuba xa ubhala kwesispreadsheet sakho ungadluli kulaa mthamo.
Pamela: OK kufuneka ibenga...
Rushman: Now that Msindisi usithi kwisigcini-nkcukacha esisisigxina, yila nantsika leyo...
Msindisi: Yi-harddrive
Pamela: Besithe ngundoqo kodwa not esisisigxina...
Rushman: Sisigcini-nkcukacha esingundoqo besitshilo really.
Pamela: Let's first correct that... le nkqubo yekhompyutha ifuna umthamo... ifuna okanye umthamo shouldnt exceed?
Msindisi: Mawuqale ku-2.5 ukunyuka...
Pamela: Kufuneka uqale ku-2.5
Msindisi: I suppose, Lorenzo we are talking about the excell that it should have something like 2.5MB to store information. Can I read you from the ...
Lorenzo: Yes please
Msindisi: This program requires atleast 2.5MB from the harddrive.
Lorenzo: OH OK, it's a footprint, that's how much it needs to be able to run. It's like the printing space of the program. If you want to store more data then you need more space. It's not a limit but a minimum. It means that if you disk is too full or you dont have 2MB then it cannot open the program...
Rushman: Can you come again?
Lorenzo: Ummh, this is the space on the harddrive that the program needs in order to be able to run. It means if your disk is too full and you dont even have, how much is it? 2.5MB? then it's simply not going to open if it doesnt have enough space.
Rushman: Can it take more than 2.5?
Lorenzo: Yes, this is the minimum space. If you have less than this in your harddrive, you dont have enough space. It simply wont start.
Msindisi: Ifana nalaa mzekelo awenzayo wetafile. If le tafile igcwele awuzokwazi ukongeza enye into apha etafileni, awuzokwazi ukuyisebenzisa le tafile
Pamela: Ngaphandle kokuba wongeze le tafile?
Msindsi: ...ngaphandle kokuba kubekho ispace apha etafileni esinininzi. Ngaphandle kokuba kubekho ispace that 2.5 maybe... ayivakali? Sithi le tafile uyayisebenzisa for ukupheka elaa hlobo ayicacisa ngalo uLorenzo then le tafile inkulu mos then inezinto igcwele ufuna ukongeza ezinye izinto then there's a need into yokuba kubekho ispace atleast esingango-2.5...
Pamela: So kufuneka udilithe izinto...
Msindisi: For you to be able to use laa tafile kufuneka ube nesispace esi-enough.
Nomathemba: Ukuze ube nespace esi-enough kufuneka uphungule ezinye izinto?
Msindisi: yes... okanye wongeze ispace sakho
Thandeka: So laa 2.5 it's a minimum

Msindisi: yes yes, a sort... a minimum you should have kwiharddrive yakho
Thandeka: Minimum space or information?
Msindisi: Minimum space
Lorenzo: Minimum space
Pamela: OK, ... ummh this was uMonwabisi sending apologies. So le nkqubo yekhompyutha ifuna omthamo ongangesigcini-nkcukacha...

Appendix J: Moodle “patch” to glossary file view.php to record terms in file logs.txt

```
***************
*** 206,211 ****
--- 206,213 ----
    $strsearchconcept = get_string("searchconcept", "glossary");
    $strsearchindefinition = get_string("searchindefinition", "glossary");
    $strsearch = get_string("search");
+    $filename = 'logs.txt'; //// This was added by me, it is the name of the log file
+
    $navigation = "<a href=\"index.php?id=$course->id\">$strglossaries</a> ->";

    print_header_simple(format_string($glossary->name), "",
***************
*** 272,277 ****
--- 274,287 ----

    include_once("sql.php");

+ //// write the entry to a file
+       if ($glossary->name == "English - isiXhosa computer glossary") { //// Check if the glossary is the one I am interested in.
+               $handle = fopen($filename, "a"); //// Open the log file.
+               fwrite($handle, "\n"); //// Insert a line brak.
+               fwrite($handle, $hook); //// Write the entry to the file.
+               fclose($handle); //// Close the log file.
+       }
+
 /// printing the entries
    $entriesshown = 0;
    $currentpivot = '';
```

Appendix K: Example from XML export file for the glossary (version December 2008)


```
<?xml version="1.0" encoding="UTF-8"?>
<GLOSSARY>
 <INFO>
  <NAME>English - isiXhosa computer glossary</NAME>
  <INTRO>
&lt;div style=&quot;text-align: justify;&quot;&gt;Le yingcaciso yesiXhosa yesigama sekhompyutha. Iphuhliswe yiTerminology Unit yeSANTED Prog&lt;span class=&quot;nolink&quot;&gt;ramme&lt;/span&gt;/Icandelo leeLwimi zesiNtu (African Languages Studies Section), Isikolo seeLwimi (School of Languages), Rhodes University ngokusebenzisana neTelkom Centre of &lt;span class=&quot;nolink&quot;&gt;Excellence&lt;/span&gt;.&lt;br /&gt;&lt;br /&gt;Ukuba ukhangela igama, ungalifumani kwingcaciso, liyaqatshelwa ze ke sizame ukulifaka ngokukhawuleza. Nawe ungongeza amagama akho nengcaciso yawo ngokusebenzisa isalathisi esithi &amp;quot;Add a new entry&amp;quot;.&lt;br /&gt;&lt;br /&gt;Nceda, uncedisane nathi ekukhuliseni nasekuphuhliseni isigama ngokuthi unike ezakho izimvo (Sebenzisa uphawu kwikona esemazantsi ekunene kwibhokisi nganye yengcaciso). Unakho nokuyinika amanqaku ingcaciso (1 = imbi kakhulu, 5 = ilungile kakhulu).&lt;/div&gt;</INTRO>
  <STUDENTCANPOST>1</STUDENTCANPOST>
  <ALLOWDUPLICATEDENTRIES>0</ALLOWDUPLICATEDENTRIES>
  <DISPLAYFORMAT>dictionary</DISPLAYFORMAT>
  <SHOWSPECIAL>0</SHOWSPECIAL>
  <SHOWALPHABET>0</SHOWALPHABET>
  <SHOWALL>0</SHOWALL>
  <ALLOWCOMMENTS>1</ALLOWCOMMENTS>
  <USEDYNALINK>1</USEDYNALINK>
  <DEFAULTAPPROVAL>0</DEFAULTAPPROVAL>
  <GLOBALGLOSSARY>0</GLOBALGLOSSARY>
  <ENTBYPAGE>10</ENTBYPAGE>
  <ENTRIES>
   <ENTRY>
    <CONCEPT>Window</CONCEPT>
     <DEFINITION>[Ifestile] Kulapho inkqubo esetyenziswayo ikhoyo. Inomgca wesihloko phezulu. Ungayinciphisa, uyandise okanye uyivale, usebenzisa iibhokisana ezintathu ezingentla ekunene.
</DEFINITION>
    <FORMAT>1</FORMAT>
    <USEDYNALINK>1</USEDYNALINK>
```

```
      <CASESENSITIVE>0</CASESENSITIVE>
      <FULLMATCH>0</FULLMATCH>
      <TEACHERENTRY>1</TEACHERENTRY>
      <ALIASES>
       <ALIAS>
        <NAME>festile</NAME>
       </ALIAS>
      </ALIASES>
      <CATEGORIES>
       <CATEGORY>
        <NAME>Isibonisi-ntetho</NAME>
        <USEDYNALINK>1</USEDYNALINK>
       </CATEGORY>
      </CATEGORIES>
     </ENTRY>

...

     <ENTRY>
      <CONCEPT>Netiquette</CONCEPT>
           <DEFINITION>[I-Netiquette] Indlela yokuziphatha efanelekileyo xa usebenzisa i-intanethi ne-imeyile. Umzekelo akufanelekanga ukuba uthumele i-imeyile engenasihloko okanye ukungena kwiikhompyutha zabanye abantu bengazi.</DEFINITION>
      <FORMAT>0</FORMAT>
      <USEDYNALINK>1</USEDYNALINK>
      <CASESENSITIVE>0</CASESENSITIVE>
      <FULLMATCH>0</FULLMATCH>
      <TEACHERENTRY>1</TEACHERENTRY>
      <ALIASES>
       <ALIAS>
        <NAME>Netiquette</NAME>
       </ALIAS>
      </ALIASES>
     </ENTRY>
    </ENTRIES>
   </INFO>
</GLOSSARY>
```

Appendix L: Publications resulting from my research project

Supervision

Kos, S. (2007). "Creating multimedia material in isiXhosa to teach computer literacy". BSc Honours dissertation in Computer Science at the University of Fort Hare.

Sam, M. (2007). "Development and implementation of a web-based isiXhosa glossary of computer terms". BSc Honours dissertation in Computer Science at the University of Fort Hare.

Madwe, N. (2008). "Issues of quality in the localisation of ICT material into isiXhosa". BSocSci Honours dissertation in Communication at the University of Fort Hare. Awarded with distinction.

Articles in peer-reviewed journals

Dalvit, L., Murray, S., Mini, B., Terzoli, A. & Zhao, X. (2005). "Computers and African Languages in Education: Eternal Enemies or Newly-Found Friends? An ICT Tool for the Promotion of African Languages at a South African Institution". *Perspectives in Education,* 23(4), 123-131.

Dalvit, L., Murray, S., Mini, B., Terzoli, A. & Zhao, X. (2006). "Production of and Access to ICT-Based Knowledge through English and African Languages at a South African University". *South African Journal of Higher Education (SAJHE),* 19, 1486-1498.

Dalvit, L., Murray, S., Mini, B., Terzoli, A. & Zhao, X. (2005). "Providing increased access to English L2 Students of Computer Science at a South African University". *Journal of US – China Education Review,* 2(9), 72-75. Available online: http://www.teacher.org.cn/doc/ucedu200509/ucedu20050915.pdf (last accessed 6 April 2006).

Dalvit, L., Murray, S., & Terzoli, A. (2009). "Deconstructing language myths: can English be used as a language of teaching and learning in South Africa?". Paper accepted for publication in a special Kenton issue of the *Journal of Education.*

Maseko, P., Nosilela, B., Mapi, T., Sam, M., Dalvit, L., & Terzoli, A. (2009). "The role of the Web in the promotion of African languages". Accepted for publication in a special issue of *Alternation.*

Articles in non-peer-reviewed journals

Dalvit, L. (2008). "Computer literacy in an African language at Rhodes". *Aplied Linguistics and Literacy in Africa (AILA) newsletter,* 7–8. Available online: http://www.google.co.za/url?sa=t&source=web&ct=res&cd=1&url=http%3A%2F%2Frenafrica.org%2FDocs%2FAfrica_ReN_April-hires.pdf&ei=6Da9SIukFJDK1wbzwqGXAw&usg=AFQjCNGnM19N7KYqHUwG-6d6A9Y9cx4rCg&sig2=G7xlQ7zaWBcwYKrZxf41pg

Conference (full papers)

Dalvit, L., Murray, S., Terzoli, A. & Zhao, X. (2004). "E-learning per l'Uguaglianza in Sudafrica: una Risorsa Multilingue per l'insegnamento dell'Inofrmatica" *(E-Learning for Equality in South Africa: a multilingual Resource for the Teaching of Computer Science).* Paper presented at *Expo E-learning Ferrara 2004,* 9-11 October 2004, Ferrara (Italy).

Dalvit, L., Murray, S., Terzoli, A. & Zhao, X. (2004). "Development of a Web-Based Multilingual Resource for Equal Access to ICT Education in South Africa". Paper presented at the *International Symposium on ICT Education and Applications in Developing Countries*, 19-21 October 2004, Addis Ababa (Ethiopia).

Dalvit, L., Murray, S., Terzoli, A. & Zhao, X. (2005). "*E-Ncedo*: a Web-Based Resource to Bridge the Language Gap and the Digital Divide in ICT Education in South Africa". Demonstration held at the *World Conference on Computers in Education (WCCE)*, 4-7 July 2005, Cape Town.

Dalvit, L., Murray, S., Mini, B., Terzoli, A. & Zhao, X. (2005). "Providing increased access to English L2 Students of Computer Science at a South African University". Paper presented at the *4th International Conference on Technology in Teaching and Learning in Higher Education*, 11-13 July 2005, Beijing (China).

Dalvit, L., Mini, B., Murray, S., Terzoli, A. & Zhao, X. (2005). "Access to ICT-Based Knowledge through English and African Languages at a South African University". Paper presented at the conference on *Knowledge Production and Higher Education in the 21st Century (Knowledge 2005)*, 31 August-2 September 2005, Bergen (Norway).

Dalvit, L., Terzoli, A., & Murray, S. (2008). "La conoscenza indigena nell'educazione all'Inofrmatica in Africa: da Gramsci all'Etno-informatica" *(Indigenous Knowledge and the teaching of Computer Science in Africa: from Gramsci to Ethnocomputing).* Paper presented at *Didamatica.* 28-30 April 2008, Taranto (Italy). This is a considerably re-worked and summarised translation of the paper presented at WCCE 2008.

Dalvit, L., Maseko, P., Nosilela, B., Mapi, T., Sam, M., Terzoli, A., & Bailey, D. (2008). "The first translate@thon at Rhodes: localising Horde/Imp into isiXhosa". Paper submitted for presentation at the *10th annual conference on WWW Applications*, 3-5 September 2008, Cape Town.

Dalvit, L., Murray, S., & Terzoli, A. (2008). "Gramsci, functional linguistics and ethnocomputing: the role of indigenous knowledge and languages in computer education in Africa". Paper presented at the *Wold Conference on Computers in Education (WCCE)*, 7-10 September 2008, Milan (Italy).

Dalvit, L., Terzoli, A., & Wolff, F. (2008). "Open source and localisation into indigenous South African languages with Pootle". Paper presentation at the *Southern African Telecommunication Networks and Applications Conference (SATNAC)*. 8-10 September 2008, Wild Coast Sun, Wild Coast.

Sam, M., Dalvit, L., & Maseko, P. (2009). "ICT terminology development for the intelelctualisation of African languages". Paper accepted for presentation at the *10th International Conference on Implications of Computers in Developing Countries,* 26 – 28 may 2009, Dubai (United Arab Emirates).

Conferences (work-in-progress/ abstracts)

Dalvit, L., Hitchcock, J., Murray, S. & Terzoli, A. (2004). "A Web-Based Tool for Bilingual ICT Education". Paper presented at the *Southern African Telecommunication Networks and Applications Conference (SATNAC)*, 5-8 September 2004, Cape Town.

Dalvit, L., Mini, B., Murray, S., Terzoli, A. & Zhao, X. (2005). "ICT Education, language and equality: a multilingual intervention". Paper presented at the *Kenton Conference*, 27-30 October 2005, Mpekweni.

Dalvit, L., Murray, S., & Terzoli, A. (2006). "Presence and performance of African students in the field of Computer Science at Rhodes University: a statistical approach". Paper presented at the *Kenton Conference*, 28 November – 1 December 2006, Wilderness, Southern Cape.

Kos, S., Sam, M., Dalvit, L., Terzoli, A., & Thinyane, M. (2006). "Creating a multimedia, web-based glossary to promote multilingualism in education". Paper presented at the *Kenton Conference*, 28 November – 1 December 2006, Wilderness, Southern Cape.

Gunzo, F., Madwe, N., Dalvit, L., Mapi, T., & Terzoli, A. (2007). "Evaluation of quality and use of African languages in Information and Communication Technologies (ICTs)". Paper presented at the *African Languages Association of South Africa (ALASA) Conference*, 9 - 11 July 2007, Port Elizabeth.

Dalvit, L., Murray, S., Nosilela, B., & Terzoli, A. (2007). "Can English be used in South African schools?". Paper presented at the *Kenton Conference,* 25-28 October 2007, Phumula, KwaZulu-Natal.

Dalvit, L., Murray, S., & Terzoli, A. (2007). "Development of content and interface for an on-line glossary of computer terms in isiXhosa". Paper presented at the *Kenton Conference,* 25-28 October 2007, Phumula, KwaZulu-Natal.

Dalvit, L., Kaschula, R., & Sam, M. (2007). "Development and adoption of isiXhosa terminology to teach Computer Literacy". Paper presented at the *Kenton Conference,* 25-28 October 2007, Phumula, KwaZulu-Natal.

Madwe, N., Gunzo, F., Dalvit, L., Mapi, T., & Terzoli, A. (2007). "The relationship between language and quality in the field of ICT: the case of isiXhosa". Paper presented at the *Kenton Conference,* 25-28 October 2007, Phumula, KwaZulu-Natal.

Dalvit, L., Mbombela, S., Rungqu, E., Terzoli, A., & Thinyane, M. (2007). "Multimedia concept maps to explain ICT terms in isiXhosa". Paper presented at the *Kenton Conference,* 25-28 October 2007, Phumula, KwaZulu-Natal.

Sam, M., Dalvit, L., & Kachula, R. (2008). "The discussion of observation and analysis of the development of computer terminology in isiXhosa". Paper presented at the *NRF Post-Graduate Colloquium*, 23 May 2008, Walter Sisulu University, Mthatha.

Sam, M., Dalvit, L., Kaschula, R., & Maseko, P. (2008). "Folklore and ICT education in Africa: the development of ICT terminology in isiXhosa". Paper presented at the *10th biennial conference of the Southern African Folklore Society (SAFOS),* 23-25 September 2008, Roma (Lesotho).

Dalvit, L., Gunzo, F., & Sam, M. (2008). "Integrating teaching, research and outreach in teacher training". Paper presented at the K*enton Conference,* 23-26 October 2008, Thabeng sa Mogale, Gauteng.