DURBAN UNIVERSITY OF TECHNOLOGY

UNDERSTANDING THE INFLUENCE OF A SECOND LANGUAGE ON THE ACADEMIC PERFORMANCE OF LEARNERS IN INFORMATION TECHNOLOGY: A CASE STUDY OF ISIZULU-SPEAKING ENGLISH SECOND LANGUAGE LEARNERS IN KWAZULU NATAL

Mandisa Purity Njobe

May 2007

UNDERSTANDING THE INFLUENCE OF A SECOND LANGUAGE ON THE ACADEMIC PERFORMANCE OF LEARNERS IN INFORMATION TECHNOLOGY: A CASE STUDY OF ISIZULU-SPEAKING ENGLISH SECOND LANGUAGE LEARNERS IN KWAZULU NATAL

by

Mandisa Purity Njobe

A research dissertation submitted in complete fulfillment of the degree of Masters of Technology in Information Technology in the Department of Information Technology, Durban University of Technology, Durban, South Africa.

Durban, October 2006

APPROVED FOR FINAL SUBMISSION

_____ _____

Mrs D Heukelman, M. Ed. (Rhodes) Date

Supervisor

DECLARATION OF ORIGINALITY

I, Mandisa Purity Njobe declare that this thesis,

"Understanding the influence of a second language on the academic performance of learners in Information Technology: a case study of isiZulu-speaking English second language learners in KwaZulu Natal"

is my own work under the supervision of Mrs. D. Heukelman and all sources I have used have been indicated and acknowledged by means of complete references.

_____

Mandisa Njobe

Acknowledgements

I wish to acknowledge the contribution of many individuals, departments and organisations, who have played a major role in the Tholulwazi project. The following people deserve special mention:

To a special person, my supervisor Mrs. Delene Heukelman, for guiding the project to success, and without whose personal supervision these accomplishments would not have been possible.

To my co-supervisor Dr. Eyono Obono, for guiding the project to success, especially in the section on correlation and data mining.

To Mrs Nayantra Kanaye, for her generosity in offering to edit the thesis.

To Mr. Dwayne Bailey of Translate.org.za and his team of dedicated translators, for providing a strong foundation for the project.

To Professor Zulu of the University of KwaZulu-Natal for his invaluable assistance about the Zulu culture.

To the research leaders / fellows in the faculty of Commerce, Professor Nepal, Dr. Marie de Beer and Professor Malcolm Wallis, for their unwavering support.

To the Department of Language and Translation at the Durban University of Technology (DUT), for providing professional support in the translations.

To the Department of Education, KwaZulu-Natal province, for granting permission for this research to be conducted in schools.

To the National Research Foundation and the DUT for sponsoring the project, without whose funds this project would not have been successful.

To the research department at the DUT for supporting the project.

To my fellow colleagues and learners in the Information Technology Department at DUT, for their help in whatever way possible.

To Miss N. Sosibo and Mr. B. Ngxatha for their assistance offered to teach Development Software 1 in isiZulu.

To all schools, learners and the members of communities that participated in the project.

Finally, I would like to thank my daughter, Mthaniya Elizabeth Gazu, for her support and understanding throughout my studies.

Mandisa Purity Njobe

May 2007

Abstract

Over the years, computers have been introduced to many South African classrooms in an attempt to improve education, and this is true for Previously Technologically Disadvantaged (PTD) schools in Kwazulu-Natal with learners whose first language is isiZulu. However, frameworks of computer learning vary widely and there is a crucial need to understand how specific situational conditions either facilitate or constrain the implementation of computer-supported learning in these schools.

This thesis discusses research undertaken to document the process of introducing localised OpenOffice.org.za software with an isiZulu interface into Information Technology education at PTD schools in the KwaZulu-Natal province. The thesis also documents the process of introducing a dual language medium in Information Technology at the Durban University of Technology. The study investigates the English language as one of the possible causes of the lack of understanding of computers by English second language learners. The research takes the form of a case study to determine the level of understanding of the user interfaces of the OpenOffice.org.za application and a programming subject (Development Software 1), when presented in first and second languages. The results of the study show that English second language learners perform better when taught in the isiZulu language first then in English.

Keywords: Previously Technologically Disadvantaged (PTD) schools, second language, first language, software, localisation, user interface, application, learners, Computer Literacy (CL), Information Technology (IT).

TABLE OF CONTENTS

1. CHAPTER 1: RATIONALE FOR THE STUDY

1.1	Background to the research	1
1.2	Background to Information Technology education	4
1.3	Problem statement	5
1.3.1	Main research questions	6
1.3.2	Research questions and objectives	6
1.3.3	The hypothesis of the study	8
1.3.4	Problem statement overview	9
1.4	The impetus for the study	9
1.5	Significance of the study	11
1.6	Method of research	12
1.6.1	Survey: Schools and DUT (IS1) Pre & Post Questionnaire	13
1.6.2	Experiment: IS 1 interface & DUT (DS1) class	14
1.7	Limitations of the study	14
1.7.1	Pilot study problems	14
1.7.2	DUT problems	16
1.8	Structure of the thesis	17
1.9	Summary	18

2. CHAPTER 2: LITERATURE REVIEW

2.1 Introduction 19

2.2 Literature review 19

2.2.1 Previous research 19

2.2.2 General information 23

2.2.2.1 Theory on computer concepts 24

2.2.2.2 Teachers and Information Technology education 27

2.2.2.3 Issues around PTD life 29

2.2.2.4 The language acquisition process 32

2.3 L10N initiative 34

2.4 Summary 36

3. CHAPTER 3: SOFTWARE L10N PROJECT: TRANSLATE.ORG.ZA, THOLULWAZI

3.1 Introduction 37

3.2 Background to Open Source Software (OSS) 37

3.3 Background to OpenOffice.org.za 39

3.4 Background to Translate.org.za 41

3.5 Localisation process 42

3.5.1 Translate@thon 42

3.5.2 Technicalities of the software L10N process 43

3.6 Summary 45

4. CHAPTER 4: METHODOLOGY

4.1 Introduction 46

4.2 Research approach 46

4.3 Research method 47

4.4 Data gathering 48

4.5 Selection process 49

4.5.1 Schools' selection 49

4.5.1.1 Schools sampling method 50

4.5.1.2 Schools sampling size 51

4.5.2 DUT (IS1) first selection 52

4.5.2.1 DUT (IS1) sampling method 52

4.5.2.2 DUT (IS1) sampling size 52

4.5.3 SACTWU selection 53

4.5.3.1 SACTWU sampling method 53

4.5.3.2 SACTWU sampling size 53

4.5.4 DUT (DS1) second selection 54

4.5.4.1 DUT (DS1) sampling method 54

4.5.4.2 DUT (DS1) sampling size 54

4.6 Research instruments 55

4.6.1 Instrument analysis 56

4.6.1.1 Statpac & Ms Excel spreadsheet analysis 56

4.6.1.2 WEKA data mining software 58

4.6.1.3 Ms Excel format for WEKA 59

4.6.1.4 The WEKA Apriori Algorithm 60

4.6.2 The questionnaire 62

4.6.3 Validity of questions 64

4.6.4 Administration of questionnaires 65

4.6.4.1 First stage 65

4.6.4.2 Second Stage 67

4.6.4.3 Third stage 69

4.6.4.4 Fourth stage 70

4.6.5 The presentation process 72

4.7 DUT (IS1) computerised tests 73

4.7.1 DUT (IS1) pre-test 73

4.7.2 DUT (IS1) post-test 74

4.8 Problems encountered and possible improvements 75

4.8.1 Schools' problems 75

4.9 Summary 76

5. CHAPTER 5: RESULTS

5.1 Introduction 77

5.2 Confidentiality statements and ethics 77

5.3 The questionnaires 78

5.4 The analysis 79

5.4.1 Schools' analysis 80

5.4.1.1 English proficiency 80

5.4.1.2 IsiZulu proficiency and its development for academic p.. 83

5.4.1.3 IsiZulu as a language in Information Technology Edu.. 85

5.4.1.4 Reflection on software translation projects 89

5.4.1.5 Attitudes towards the isiZulu language software 90

5.4.2 DUT (IS1) pre-questionnaire results 91

5.4.2.1 English proficiency 91

5.4.2.2 IsiZulu proficiency and its development for academic p. 94

5.4.2.3 IsiZulu as a language in Information Technology education 95

5.4.2.4 Reflection on software translation projects 99

5.4.2.5 DUT (IS1) pre-test 99

5.4.2.6 DUT (IS1) post-test 100

5.4.2.7 Pre and post-test analysis 101

5.4.2.8 Post-questionnaire analysis 102

5.4.3 Pilot study and DUT (IS1) results combined 105

5.4.4 DUT (DS1) sample results 109

5.4.4.1 Group C Analysis 109

5.4.4.2 Group D Analysis 111

5.4.4.3 Group E Analysis 114

5.4.4.4 Group PTB Analysis 116

5.4.4.5 Group PTA Analysis 118

5.4.4.6 Overall Analysis 121

5.4.4.7 DUT (DS1) Findings 124

5.4.5 Summary 124

6 CHAPTER 6: SUMMARY AND CONCLUSION

6.1 Introduction 125

6.2 What was learnt 125

6.2.1 Information Technology knowledge 126

6.2.2 Language knowledge 127

6.3 What remains to be learnt 129

6.4 Limitations of the study 130

6.4.1 Sample selection 131

6.4.2 Survey instruments 131

6.4.3 General limitations 131

6.4.3.1 Lack of technological skills 131

6.4.3.2 Shortage of technicians 132

6.4.3.3 Lack of financial resources 133

6.5 Benefits of the study 133

6.6 Recommendations

6.6.1 Schools and DUT recommendations 134

6.6.2 Teachers recommendations 135

6.7 Conclusion 137

7 REFERENCES

8 APPENDICES

LIST OF FIGURES

Figure 1.1	S.A Language Distributions	3
Figure 2.2	SA Population Distributions	22
Figure 4.5	Identification of schools using a compass	50
Figure 5.1	Apriori psedo code showing the algorithm	62
Figure 5.3	Language of Questionnaire	78
Figure 5.4.2.7a	Variance in percentages	101
Figure 5.4.2.7b	Variance in averages	102
Figure 5.4.3a	Language of choice	106
Figure 5.4.3b	Studying in isiZulu	107
Figure 5.4.3c	The language challenge	107
Figure 5.4.3d	The Graduates Challenge	108
Figure 5.4.5a	Group C Correlation	109
Figure 5.4.5b	Group C Progress	110
Figure 5.4.5c	Group D Correlation	111
Figure 5.4.5d	Group D Progress	112
Figure 5.4.5e	Group E Correlation	114
Figure 5.4.5f	Group E Progress	115
Figure 5.4.5g	Group PTB Correlation	116
Figure 5.4.5h	Group PTB Progress	117
Figure 5.4.5i	Group PTA Correlation	118
Figure 5.4.5j	Group PTA Progress	119
Figure 5.4.5k	Overall Correlation	121
Figure 5.4.5l	Overall Progress	122

LIST OF TABLES

Table 4.6	Research instruments	56
Table 5.1	Schools perceptions about English language	80
Table 5.2	Schools English entry level	81
Table 5.3	Schools English challenge	82
Table 5.4	Schools English competency on Information Technology	83
Table 5.5	Schools spoken and written isiZulu	84
Table 5.6	Schools importance of isiZulu	84
Table 5.7	Schools possible learning in isiZulu	85
Table 5.8	Schools differences between spoken isiZulu and isiZulu software	86
Table 5.9	Schools isiZulu OSS introduction	86
Table 5.10	Choice of study	87
Table 5.11	Schools native isiZulu instructors	88
Table 5.12	Possible dual-medium in IT	88
Table 5.13	Schools dual-medium IT	89
Table 5.14	Schools isiZulu recommendation	90
Table 5.15	Schools Translate.org.za recommendation	90
Table 5.16	DUT perceptions around the English language	92
Table 5.17	DUT English entry level	92
Table 5.18	DUT English challenge	93
Table 5.19	English competency	93
Table 5.20	DUT spoken and written IsiZulu	94
Table 5.21	DUT importance of isiZulu	94

Table 5.22	DUT Studying in isiZulu	95
Table 5.23	DUT differences between spoken isiZulu and isiZulu software	96
Table 5.24	DUT software introduction level	96
Table 5.25	DUT choice of study	97
Table 5.26	DUT teacher involvement	97
Table 5.27	DUT dual-medium solution to IT	98
Table 5.28	DUT dual-medium solution to success	98
Table 5.29	DUT isiZulu recommendation	99
Table 5.30	DUT Translate.org.za recommendation	99
Table 5.31	DUT Post choice of study	103
Table 5.32	DUT Post studying in isiZulu	103
Table 5.33	DUT post language challenge	104
Table 5.34	DUT Post possible dual-medium instruction	104
Table 5.35	DUT Post isiZulu recommendation	105
Table 5.36	DUT Post Translate.org.za recommendation	105

CHAPTER 1

RATIONALE FOR THE STUDY

1.1 Background to the research

In recent years, there has been an increased awareness of Information Technology education in Southern Africa (SA). Moreover, the South African government is providing many Previously, Technologically Disadvantaged (PTD) schools with computers. This initiative provides learners with an opportunity to engage in Information Technology education at an early stage of learning. However, Information Technology education is only accessible in English, which is a second language for learners from these schools, since SA is a linguistically diverse society. Numerous studies on language abilities of second language learners' indicate that learners have difficulties learning in a second language (Bruhns and Hoffman, 2005, Ellis, 1994). Ones response to this challenge would be to implement a dual-medium, learning environment. However, with new discoveries of the digital age in SA, very little is known about the feasibility of localising Information Technology education into the country's indigenous languages. It is therefore important to understand how language either facilitates or constrains the implementation of Computer Literacy learning.

At present, Translate.org.za is one of the very few Non-Government Organisations (NGO) in SA to play a part in localising software into the country's 11 official languages. Translate.org.za was established in 2001 (Bailey, 2003). The organisation intends to acquire

additional participation from communities willing to “get up and do it for themselves” (Bailey, 2003). The Durban University of Technology’s (DUT), LOCALISATION (L10N) project (also known as Tholulwazi) has been working in conjunction with Translate.org.za on isiZulu software since 2003. Tholulwazi simply means “Find Knowledge”. The term “Tholulwazi” was especially coined for this project because of its relevant meaning to obtaining newly discovered knowledge. Tholulwazi is not only engaged in localising software but it has also studied the viability of the existing localised software and its impact in Computer Literacy. This was implemented by testing the levels of performances as well as attitudes of participants when using computer software. Tholulwazi also introduced a dual-medium instruction in one of the programming languages, Development Software 1 (DS1) offered at the DUT. This was implemented in group sessions. By doing so, Tholulwazi hopes to promote dual-medium instruction in IT and also to prove the benefit of localising software for the KwaZulu-Natal (KZN) community.

It is acknowledged that the English language is used as a medium of instruction throughout the country. However, some black and Afrikaner majority schools still use first languages to simplify basic education. Computer learning however, which has been introduced in South African schools, may result in a poor understanding of computers by English second language learners. This research, therefore, hopes to come up with a method of simplifying Computer Literacy learning by focusing on translating open source software into the isiZulu language as well as introducing dual-medium IT teaching and learning. Moreover, the study investigates the need for localising software user interfaces for English second language learners.

IsiZulu is the language of a group of the Nguni people. Olivier (2001) describes the word 'isiZulu' as having originated from the name of the chief who founded the royal line in the 17th century. According to Mngadi in Olivier (2001), the written form of the isiZulu language was started by missionaries through their teachings of the word of God.

Figure 1.1 below shows that the majority of South Africans in rural and urban areas as well as townships speak isiZulu. In comparison to other languages in the country, statistics show that isiZulu is the first language of 23.8% of South Africa's roughly 45 million people followed by isiXhosa at 17.6%, Afrikaans at 13.3%, Sepedi at 9.4% and English at 8.2% (Statistics SA, 2003). The DUT, where this research was undertaken, is also based in the heart of the province of KwaZulu-Natal. DUT is one of the highly recognised higher education institutions known to provide state of the art Information Technology education.

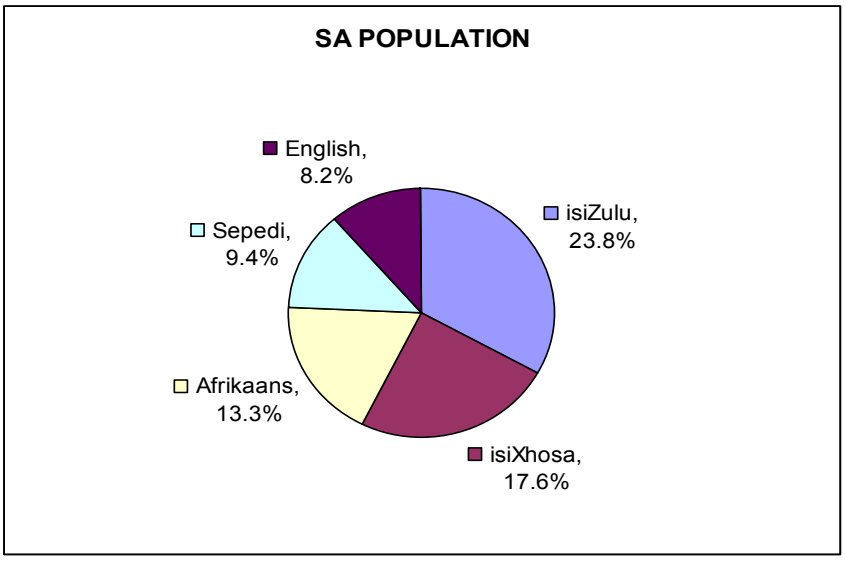


Figure 1.1: S.A Language Distribution

Information Technology education revolves around software. This is often experienced in the change of the content of many technology subjects as a result of software upgrades. Software is written coded commands that communicate to a computer the tasks it needs to perform. Both technology experts and end-users at different levels use software. Technology experts however are concerned with the code and the end-users with the interface program, also known as the user interface. Software L10N is implemented on the user interface, since it is a communication program between the user and the computer. L10N includes translating program menus, error messages, help, time, date and other interface screens that are seen by the user. Usually the appearance of the English and the localised user interfaces is the same. Over the years, user interfaces have been redesigned to meet the needs of end-users and to keep up with the growth in Information Technology (IT) learning.

1.2 Background to Information Technology education

This section provides an insight into Information Technology education and how the isiZulu language can be incorporated to support Computer Literacy learning.

The field of Information Technology in education could be problematic to many people, because of its constant changing nature. Williams and Sawyer (2003) express doubt as to whether technology developers understand technology themselves. Moreover, Information Technology education, in general, incorporates quite a few subdivisions, which determine one's specific focus and level in the IT field. At most, Information Technology education at a school level consists of Windows basics and a few application programs including a word processor, presentation application, spreadsheet, drawing application and sometimes the

internet. These applications are grouped into one subject commonly known as Computer Literacy. Many institutions also offer Computer Literacy or similar computer introductory courses in various departments as either a course requirement or an elective.

Tholulwazi initially intended to focus on KZN schools, but due to a lack of sufficiently resourced schools in which to undertake this project, the project then spread over to the DUT's Department of Information Technology (IT) (this section is further explained in chapter 4).

The problem statement is formulated from the viewpoint of end users, particularly learners, who are at a moderate level of Computer Literacy. The scope of the project considers a moderate user as one who has used a computer to type simple documents, is able to perform a few basic computer operations (such as starting a program, saving and closing) and who is able to respond to computer messages. It was thus assumed that all participants had been introduced to Computer Literacy. IsiZulu was then used in the user interface of Computer Literacy applications, to provide an alternative for learning computers.

1.3 Problem statement

Academic performance of English second language learners in Information Technology is not satisfactory in general and more specifically in programming.

1.3.1 Main research questions

Will the use of isiZulu in the user interface of a computer application improve the English second language learners' understanding?

Will the use of a dual-medium instruction in Information Technology education improve English second language learners' understanding of IT concepts?

1.3.2 Research questions and objectives

This section addresses some of the questions that rose from the problem.

1.3.2.1 What are the learners' attitudes and beliefs towards English and isiZulu and their relative role in IT education?

An understanding of the attitudes towards these languages is essential in determining the learners' interests in possible dual-language-medium Information Technology education. The evidence will indicate whether it is necessary to provide an alternative to computer language learning environment or not.

At this stage, one of the challenges facing Information Technology education is assumed to be the English language used in the user interfaces of programs. However, it is possible that English is not such a major problem, and perhaps

the terms used in the user interface are too complicated to be understood by an average user. Understanding the situation will help in determining whether it is viable to localise software or if a possible rephrasing of complex wording should be considered. However, it must be kept in mind that many computer users interact solely with systems designed in a language, which is not their first language, such as English. This, therefore, restricts the users in exploring further since they may not fully understand nor be comfortable with the user interface, which is in their second language.

1.3.2.2 How should isiZulu be introduced as a medium of instruction in order to enhance learners' performance in IT?

The focus of the study is to assist English second language learners in the learning of IT. Hence, the objective is not to remove the English language as a medium of instruction. The answer to this question will provide an insight to the language preferences, if given the following choices: English Only, isiZulu only, isiZulu then English, English then isiZulu or both.

The results of the study will determine whether isiZulu should be used as the main medium of instruction in Information Technology rather than English.

1.3.2.3 How does the English and isiZulu computer interfaces affect the learners' proficiency when using a computer?

It is reasonable to expect to find differences in the IT test results. However, it is hoped that the results would give a deeper insight into the matter under investigation.

The research objective is mainly to answer these three afore mentioned questions. Assuming that these questions contribute to the understanding of the influence of a second language on the academic performance of learners in Information Technology; more specifically the investigation centres on the influence of using English in IT education on English second language learners, whose first language is isiZulu.

1.3.3 The hypothesis of the study

Using isiZulu language in the user interface of a program could contribute to a greater understanding of Computer Literacy as a subject and elevates the level of Computer Literacy of English second language learners.

Correlation between second language instruction and subject matter understanding, learners' self-confidence, and learners' academic performance.

- Learning first in isiZulu then in English improves the learners' understanding of the subject matter.
- Learners' perceptions change after having experienced formal IT education first in isiZulu then in English.

1.3.4 Problem statement overview

The problem statement addresses the issue of communication between the user and the computer application in a learning situation, for second language learners.

A user interface is a subtopic of Human Computer Interaction (HCI), which focuses on software issues rather than on the hardware. HCI defines what happens when a user interacts with the computer. As its name implies, HCI consists of three parts: the user (human), the computer itself, and the ways they work together (interact). There are obvious differences between humans and computers. In spite of these, HCI attempts to ensure that they both get on with each other and interact successfully. The interaction is facilitated by the user interface, which is generally presented in English. English is a second language for many learners in SA. The problem statement was then formulated considering the language-learning barrier to Computer Literacy.

1.4 The impetus for the study

The impetus for this study came from examining the process of computer adaptability of the first year Information Technology (IT) learners at the DUT who matriculated from both PTD black schools and multiracial schools. Information Systems 1 (IS1) is one of the introductory subjects offered by the Department of Information Technology in the National Diploma (IT). Information Systems is a major subject in the National Diploma and all first year learners (approximately 350) have to register for Information Systems 1 in their first year.

The subject content includes theory sessions about the computers and practical sessions on the Microsoft Office suite. In the first term, learners are introduced to a practical component of Windows basics, which normally takes two weeks and later to Microsoft Word. In the Microsoft Word sessions, learners are introduced to a word processing environment, which teaches them skills such as advanced typing, editing, formatting and many other features of a word processor. Different assessment methods including tests, exercises and assignments are used to evaluate the learning process. A formal practical test on Microsoft Word is given towards the end of the first term.

The results of the practical test determine how in-depth a lecturer needs to go with preparations for the next application, Microsoft PowerPoint, that is introduced in the new term. The interfaces of the Microsoft Office suite applications are very similar. Usually, when new applications are introduced in IS1, similar sections are revised informally, as they would have been covered in the previous application. The revision is done to assist learners who may still find it difficult to make a connection between applications. Studies by Lanham and Prinsloo (1978), MacDonald (1990) have shown that this difficulty is caused by learners' communicative incompetence. On many occasions, historically disadvantaged black learners are the learners with most difficulties in learning computer applications. These learners are not proficient in English, and thus when they get to tertiary institutions, they have to work harder than other learners may have to. In exceptional cases where a learner experiences major language problems in understanding what they are instructed to do on the computer, the lecturer has to assist the learner in an indigenous language. However, Ellis (1994) warns that helping students to the extreme can create different views about the kind of lecturer they think is best for them. Thus, Johnson in Meskill (2005) suggests that learners should be challenged

with materials and activities that are just beyond their current level of ability. This is ideal, especially for advanced learners. However, in a situation such as in IS1, alternative teaching methods for second language learners should be considered.

It is for the aforementioned reasons that this study was decided upon and the focus has since been in second language learners and their ability to communicate with the interfaces of a computer application.

1.5 Significance of the study

There are a number of reasons why the study is relevant within the broader Information Technology education context. In addition, there are several ways in which it seeks to address a few relatively under-researched areas.

It is clearly important for reasons of Information Technology education equity that South African teachers develop the knowledge and skills to respond to linguistic and cultural diversity, moreover, to consider how first language can serve as a resource in learning about computers. Right from the initial stages of their schooling, English second language learners are potentially disadvantaged in relation to their English-speaking peers. English speaking learners are educated through the medium of their first language whereas English second language learners are expected, in most schools, to learn through the medium of their second language. One response to a situation where PTD learners are learning Computer Literacy, in what is often their less well developed language, is for the facilitator to consciously simplify the computer terms by attempting to avoid all complex terms. For example, it is better to refer

to the ‘navigate’ option in most menus as ‘find way’. There are much more suitable words to simplify complex terms that can be used than combining them all into a difficult term.

Cruger (2005) encourages researchers to participate in activities that add value in helping English second language learners. Lanham and Prinsloo (1978) conducted a study, investigating the challenges of second language teaching and receiving. Their study revealed that both facilitators and learners have a communication problem. The problem resulted because most complex subjects such as Mathematics, Physical Science and English were taught by English speaking teachers. There were very few black teachers at that time who were qualified to teach. Nevertheless, the language problem in this country continues to exist to this day. Lanham and Prinsloo (1978) advocate that in order to ensure that learners who have a desire for technology are more successful in their academic pursuits, it is vitally important to help them to overcome the weaknesses in language that they may experience while pursuing Information Technology education.

1.6 Method of research

This section provides some information on the methodological aspects of the project. More details are discussed in chapter 4. Samples were drawn from the population of isiZulu first language speakers in KwaZulu Natal. A survey was used as the appropriate method to measure perceptions.

1.6.1 Survey: Schools, DUT (IS1), SACTWU and DUT (DS1) Pre & Post Questionnaire

Thirty questionnaires (fifteen in each language) were tested for clearness by isiZulu speaking lecturers and research learners in the department of IT at DUT. This was followed by a pilot study, which was conducted using a sample of ten PTD schools from a sampling frame of PTD schools in various regions of the KwaZulu-Natal province. The overall total number of participants from all 10 schools was a hundred and fifty (150). Questionnaires were administered as a traditional method of collecting data from the participating learners. The pilot study however did not provide enough information due to a number of problems encountered. These problems are briefly discussed in Section 1.7 of this chapter and further explained in chapter 6.

A second sample of 35 isiZulu speaking learners was drawn from the DUT's, first year IS1 IT learners. The same questionnaire that was used in the pilot study was used for the DUT (IS1) sample to gather evidence. The results obtained from this sample were sufficient to draw a conclusion. However, they lacked correlation. Tholulwazi performed a third test on a sample of 16 South African Clothing and Textile Workers Union (SACTWU) adult learners enrolled for a one-week short Computer Literacy course at DUT. The same questionnaire that was used for the previous two sample groups was used. Very few learners responded in this test, and thus, the results from it could not be used. A forth sample was drawn from the DUT's first year Development Software 1 IT learners. DUT (DS1) sample consisted of 200 learners. The questionnaires were redesigned for correlation purposes.

1.6.2 Experiment: DUT (IS1) interface & DUT (DS1) class

The computer test sessions that were initially prepared for schools were affected by the problems as listed in section 1.7 and could not be used in the pilot study. However, with the little tangible evidence obtained from the questionnaire responses, it was partly discovered that the English language in Information Technology education is a problem. Hence, 91% of learners preferred a dual-medium computer-learning environment, presented in both first and second languages. For the DUT (IS1) sample pre and post computer tests were used to gather information. A theory test was used for the DUT (DS1) sample and the results gathered were sufficient to make correlations and to draw a conclusion.

1.7 Limitations of the study

This section provides brief information on the problems encountered in the study. More details are further discussed in chapter 6. The problems are subdivided into two categories: pilot study and DUT.

1.7.1 Pilot study problems

The sample size was confined to 10 schools from a sampling frame of approximately 300 schools of all levels. The following are some of the problems that were encountered:

1.7.1.1 It was discovered that some principals and Computer Literacy teachers had provided misleading information about the computer usage, fearing that the

project would create problems for their schools. This had a major impact on the study, as it was discovered late into the start of the project that the Computer Literacy levels of many learners were not sufficient to participate in these computer tests.

1.7.1.2 There is still a huge shortage of computers, with some schools having only had two (2) computers to be shared amongst a full class of learners. This also contributes to lower levels of Computer Literacy.

1.7.1.3 Some schools had computers and did not have electricity to run them, whilst other schools did not have computer teachers.

1.7.1.4 There were very few working computers in each school; at most two (2) were up and running.

1.7.1.5 The large numbers of learners did not create a conducive environment for all learners to take full advantage of Computer Literacy.

1.7.1.6 Some computer teachers were not skilled enough to teach the subject.

1.7.1.7 Most computers are outdated, as a result many do not have CD-ROMs to allow for the installation of new software, and neither was there any network in place.

1.7.1.8 Schools are licensed to Microsoft productivity software and, as a result, some teachers did not want to hear of any other software packages other than Microsoft's, in spite of the explanation on similarities displayed.

1.7.1.9 There are no skilled technicians on the school premises to assist in the implementation of projects such as Tholulwazi.

1.7.2 DUT problems

1.7.2.1 The IT departments' application software is licensed with Microsoft.

Because of the licensing issue, lab technicians did not allow any installation of Open Source Software (OSS) in computer laboratories.

As a result, computer tests were done using arranged personal laptops and staff computers.

1.7.2.2 The department of IT supports the LOCALISATION (L10N) project, however, very little trust is put in it because of OSS maintenance issues.

1.7.2.3 Learners are only able to use Open Source Software (OSS) in their personal computers from home.

1.8 Structure of the thesis

This thesis consists of six chapters. The rest of the chapters are summarised as follows:

Chapter 2: Literature for the study

Chapter 2 starts by looking at previous studies that are relevant to the research. The chapter is spread across six topics i.e. Computer Concepts, Learners, Teachers, Issues around PTD life, Culture and Language as a linkage for all. These topics are discussed in order of their importance to the study, bearing in mind that the study is limited to IT. In the context of the discussed sections, the connection is made clear throughout, to keep to the focus of the study.

Chapter 3: Software L10N project

This chapter begins with an introduction on open source software, which forms the core of the study. OpenOffice.org.za, an open source software product, used as a research instrument in the study is also explained. Information on Translate.org.za, which is a non-profit translating organisation, is provided. These three highlighted topics lay the foundation for the rationale of this chapter, where the actual localisation process is discussed.

Chapter 4: Methodology

This chapter discusses the methodology that was followed in the study by explaining sampling methods used to select schools and the DUT, IT learners' samples. Supporting literature that

motivates the selection process is given. Further data gathering techniques and activities are discussed.

Chapter 5: Data Analysis (results)

This chapter provides an analysis of the results by first discussing the ethics that had to be followed by the study. A detailed analysis of the questionnaires and computer tests is presented. All appendices, supporting the analysis are given at the end of the thesis.

Chapter 6: Summary and Conclusions

This chapter provides a summary of the findings of the study. Recommendations for schools, learners and teachers are also provided.

1.9 Summary

South Africa is a linguistically diverse country. As a result of this diversity, there is evidence of unevenness in learning. Learning in a second language disadvantages those who are not of English origin. This study provides evidence that to level the learning field, access to all forms of technology learning should be in both first and second languages.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, work consulted during the research is reflected in a form of a literature review. The Language Center (2003) refers to a literature review as a critical look at the existing work that is significant to the study being conducted. The chapter then begins by introducing existing studies relevant to the research. Next is the theoretical framework, which entails six related topics in order of importance and relevance to Information Technology education. The topics include Computer Concepts, Learners, Teachers, Issues around PTD life, Language and Culture. Language is applied across all sections since it is a secondary matter under investigation. The literature begins with computer concepts laying a foundation for computer hardware, software, user interface and its relation to language. Hence, a wider scope for this project is Information Technology. The remaining topics are discussed, followed by a summary.

2.2 Literature review

2.2.1 Previous research

Software L10N is being introduced to a number of multi-lingual countries at an increasing rate. Forecasts predict that this trend will continue for the foreseeable future (Moher, Nortrop and

Petty, 2003). Thus, research in the areas of user interfaces and languages has followed many avenues. Early work by Plass (1998) was concerned about the criteria for the design and evaluation of the user interface of second language multimedia software. The focus of this study was particularly on the design issues rather than the language itself, considering the matters of concern between English and second language interfaces. A similar study by De Kerckhove in Evers and Day (1997) also features design issues of the user interfaces, arguing that "an interface design is a technology's public relations, sharpening its image in the market-place" (Evers and Day, 1997). These studies play a major role in the implementation of L10N projects, as they provide a thorough background and design considerations for today's localising. Work by Weir and Lepouras (2003a) deal with L10N and linguistic anomalies, that should be avoided when localising software. Additional work by Weir and Lepouras (2003b) define tools to reduce difficulties that arise in the second language context.

Several studies on user interface design are strongly reflected in the work of Myers (1998), which gives an image of the history of HCI technology, indicating how user interfaces should be structured for diverse cultures. IsiZulu is a culture, thus it links to the study of Myers. Other research areas relevant to this study include works on language-learning, culture and technology acceptance. A study by Genesee (2000) reveals that language learning is affected by the brain development. Whereas, the work of McLaughlin, Blanchard and Osani (1995) argues that language learning is affected by a cultural background. Hofstede (1991) perceives culture as mental programs, which are patterns of thinking, "feeling and acting learnt throughout ones lifetime" (Hofsede, 1991).

The arguments stated in these studies provide a background on different but interesting perceptions on language other than age, thus revealing underlying factors that could also contribute to language acquisition. The studies therefore do not limit the current research to a specific entity, but provide evidence to other researched and tested entities associated with language learning.

Allwood and Wang (1990) and Omar (1992) discovered significant differences between cultures and attitudes towards computers. In these studies, an acceptance model (TAM), developed by Davis is supported as a good model to determine user technology acceptance. A study by Victor in Evers and Day (1997) further reinforces the idea that a user interface design should incorporate cultural differences and similarities in order to establish effective communication.

The key words identified from the above research include a user interface design and technology acceptance by a specific culture and language. In summary, the studies provide evidence that the understanding of a user interface is determined by the language, the cultural background of the user and the ability to adapt to technology. Thus, in order to use a computer one needs to understand English. However, second language interfaces may become a problem for linguistically diverse countries, where people do not necessarily speak English. SA is one of the countries with people from diverse backgrounds where demographics such as race, culture and language are of a major concern. South Africa's race groups can be identified as Black Africans, Whites, Coloured and Indian/Asian. The largest race group in SA is Black Africans, who use a range of indigenous languages. Figure 2.2 shows the distribution of the population of SA by race.

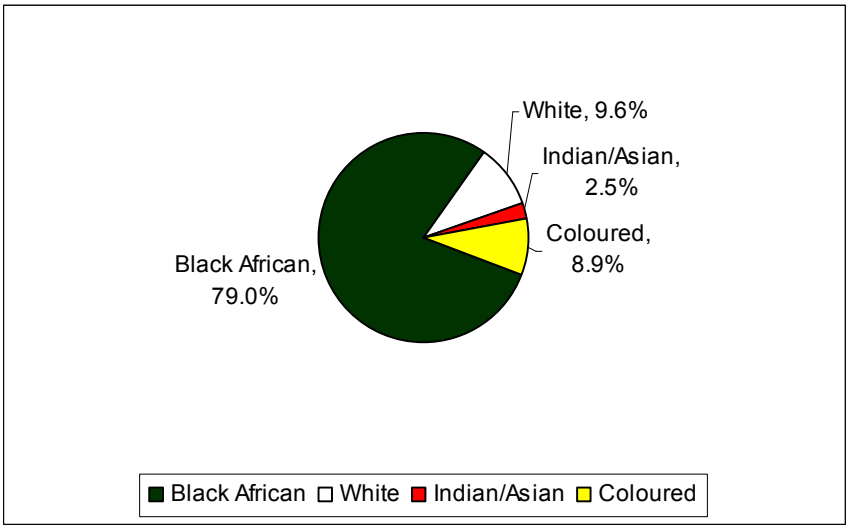


Figure 2.2: SA Population Distribution

An interview with Zulu (2005) reveals a history of the Black African culture as divided into two main indigenous language groupings, Nguni and Sotho and two minor variants, Venda and Tsonga. The main language groupings can further be subdivided into mutually intelligible subgroups where no interpretation is necessary to affect conversation and understanding. For instance, isiXhosa, isiZulu, Swazi and Ndebele, which constitute the Nguni group, are so similar in language structure, grammar and vocabulary that they are interchangeably used in the television news programs. The same applies to Tswana, Sotho and Pedi, which form the Sotho group of languages. Thus, with the inclusion of English and Afrikaans, SA has eleven official languages.

Very little formal research has been done regarding the need to translate the user interfaces into South African languages. However, a number of interfaces have been translated for various banking institutions and telephone companies, including cellular phone technology. Microsoft has also recently announced its partnership with the South African government to translate the

Windows XP Operating System and Office 2003 into isiZulu and Afrikaans (Microsoft, 2003). The Microsoft L10N project started shortly after the first release of a localised OpenOffice.org.za suite by Translate.org.za into isiZulu, Afrikaans and Sotho. Although the L10N projects are taking place in SA, there has been no research done to test the feasibility of localised software. Thus, this project goes beyond just localising software, but attempts to test the levels of the users' understanding of an isiZulu user interface.

2.2.2 General Information

As indicated in the problem statement, the study perceives language as a possible boundary to the understanding of Information Technology education of second language learners. At present, many PTD learners have limited English proficiency. It is therefore imperative to first understand how computers work. This knowledge will provide substance to the investigation of the problem. The project however does not go in-depth into areas concerning culture and theories of language, as this is not in the scope of this Information Technology study. The investigation supplies evidence that language proficiency is important in assisting learners in education in general and in Information Technology education. According to Heller (1995) in Bruhns and Hoffman (2005), "computers encourage exploration and experimentation with the semantics of language and at the same time facilitates non-verbal communication". Thus, computers form an integral part of everyone's life.

2.2.2.1 Theory on computer concepts

In this section, the key terms used throughout the thesis are defined. All unreferenced definitions are formulated to give clarity to the study.

The introduction to computers, by virtue of their unique characteristics, plays a potentially powerful role in academic subjects. Bruhns and Hoffman (2005) define computer technology as an undisputable constant reality. A computer can be defined as a powerful programming multi-use machine that is used to input data, manipulate data and produce information. Computers are made of hardware and software, the former being the physical components of a computer and the latter being the instructions that tell a computer how to perform any given task by the user. Software is further subdivided into two categories namely systems software and application software. Systems software runs as a background software, and often times it is defined as a link between the hardware and application software. Without this kind of software, it would not be possible to even use a computer. In contrast, application software are the instructions that allow users to produce end products such as documents, presentations, spreadsheets and so on. All basic computer subjects should at least introduce learners to application software, a software that many people use on daily basis. Systems software is not very crucial for an average user to know. This would be more in the domain of a qualified Information Technology expert. However, the user is exposed to the systems software desktop environment, which provides easy options directing the user to application programs.

The appearance in any application defines the interface, which enables user communication with the software. A good user interface must be made easy to understand and transparent to

the user. Many IT courses include a separate computer subject on HCI, which covers all its details including user interfaces. Software applications have programming codes behind the interface that enable the software to work. Because of the need for L10N, many software companies have decided to separate the interface from the code in order to allow translators, including non-IT experts to localise software.

For many overseas companies, L10N becomes unnecessary because of the dominance of the English language in their countries. Much motivation has to be done as to why interfaces need to be localised for other countries. The evidence is displayed by commercial software in SA. This software has been available in this country since computers were introduced, but very little has been done in terms of localising it into a South African context. Commercial software is developed in a second language culture, which carries implanted cultural notions that seem foreign to users in other cultures. Keniston (1997) believes this to be a reason why in nations where English is the dominant language, English language software presents relatively fewer problems and notes that the problem is compounded in societies where only a minor section of the population speaks English.

According to Crystal (1997), around 5% of the world population used a variant of English as a mother tongue and a further 3% had learnt English as a secondary language. Since entering the world of computers is daunting enough without having to do it in a language that is not your own, Crystal (1977) points out that,

> "…the local language computing activity should encourage the presentation of local cultural experiences through specially designed programs as their cultural identity" (Crystals, 1997).

Other countries like China, India, and France have implemented the local software. There is no specific reason why the same cannot be done for SA. Although in the beginning it might present some problems, it should be considered that every new product always comes with its side effects and it takes a lot of improvements to get it to work.

This study is concerned with the L10N of the user interface for the users and excludes the programming of an application, which is seen by highly technological individuals. End users are assumed to be unaware of the programming codes behind the user interface of a program. For this reason, the study focuses on the user interface of an application as a communication tool between the user and the computer system.

In SA, the learning of technology is restricted to English, which is the formal medium of instruction. Consequently, second language learners tend to struggle with the English content under discussion. Moreover, they may not have strong skills for communicating what they know or do not know. The widely differing literacy practices and experiences of various cultures have often been cited as a serious source of difficulty for people learning and adapting to the second language. These challenges are common, and Lanham and Prinsloo (1978) warn that when many languages are spoken within the same national borders, as in SA, one can expect all sorts of compromises between the languages. However, in order to meet the software learning needs of diverse learners, it is crucial that the Computer Literacy knowledge be as accessible as possible. If English affects natural learning, then using English to introduce subjects such as Computer Literacy does not help learners to understand Information Technology education. Furthermore, this may limit learners from becoming fully computer literate. It has also been noted that the majority of teachers of Computer Literacy in many PTD

schools are not fully exposed to computer education themselves. In the next section, more information is provided, giving evidence of teacher Computer Literacy education. Any teachers' ability to provide computer knowledge is influenced by the amount of training received prior to teaching. It is imperative, therefore, to first explore all factors that may have an impact on Information Technology education of second language learners.

2.2.2.2 Teachers and Information Technology education

Ongoing IT research on how teachers and second language learners adapt to Computer Literacy consistently indicate that the computer-learning environment is complex (Cox and Marshall, 2005). On the other hand, the sudden demand of technological empowerment for PTD schools based in rural areas, townships and informal settlements is progressing. Several projects have been implemented over the years to empower these schools. SchoolnetSA is one amongst many organisations that promote Information Technology education in the country through a series of projects. Between 1997 and 2002 SchoolnetSA implemented a Thintana iLearn project which provided R21, 2 million to setup computer centres that have internet enabled computers and servers in 200 PTD schools all over SA. However, a study conducted by SchoolnetSA (2002) has revealed that often teachers are given a short, sharp burst of training which leaves them baffled and feeling daunted by the technology. These teachers are then expected to use their limited computer skills to teach Computer Literacy in their schools. An interview with Gumede (2004), a facilitator of an Information Technology short course programme for teachers at DUT, revealed that these programs briefly introduce teachers to a Microsoft package only. These short introduction courses may compound the problem of

educators' incompetence, especially when learners' themselves are new to Information Technology education and when their English language skills are poor.

In a discussion, Ally (2004), Head of the Department of Information Technology at DUT, explained that, in his opinion, a Computer Literacy teacher should obtain, at least, a three-year Information Technology qualification. During this period, Information Technology learners (in this case the teachers) are exposed to various aspects of Information Technology covering a wide range of what should be taught at a school level. In a situation where learners are not proficient enough in English and user interfaces are written in English, the problem may result in learners' loss of interest in Information Technology education, because of the frustrations experienced as a result of not being able to explore further on their own caused by not being able to understand the language presented in the interface.

Early research by the National Center for Research on cultural diversity and second language learning (1995) emphasises that teachers of learners with limited English proficiency need to be good models of language use. Most teachers from KwaZulu-Natal PTD schools are black Africans, with the isiZulu language being their first language. It is also common for a group of people of the same race and culture to speak in their first language at social gatherings and meetings. This culture is also exercised in classrooms, where teachers have developed ways to explain meanings of concepts in indigenous languages. However, with the new Information Technology education and teachers' limited Computer Literacy, it becomes a major problem to formulate such meanings. For this reason, localising user interfaces to isiZulu will not only assist learners but also teachers to relate to technology concepts. This theory demonstrates the influence of a first language in a learning environment.

2.2.2.3 Issues around PTD life

The following section provides knowledge of home situations of second language learners in rural areas. The knowledge provided displays a connection between homes and schools, and hence, provide a connection to Information Technology education.

The term "disadvantaged" can have many meanings including people's education, developments in areas and access to resources. In this study, the term "disadvantaged" refers to unfavorable technological learning conditions. As highlighted in the problem statement, the project focuses on second language learners from KwaZulu-Natal PTD schools, mainly situated in rural areas. In most cases, learners from rural schools come from a PTD background. Depending on the financial standing of the families, learners whose parents can afford school fees enroll their children in either private schools or schools that previously catered for children coming from advantaged backgrounds, which is also commonly known as ex-Model C schools. Financially challenged learners however remain in either rural, township or informal settlement schools. The English levels of ex-Model C schools and PTD schools differ. In comparison to other schools, disadvantaged schools are those with little resources that do not meet the standards required for Information Technology education. Electricity is another resource that can have a great impact on Information Technology education. Many PTD schools have computers, yet have no electricity to utilise them. There are other resources that could also impact in learning in general such as science machinery, instruction supplements like television sets and radios, books, newspapers and magazines. The lack of the above resources place these schools at a disadvantage. These poor conditions create a huge learning gap between schools.

Lanham and Prinsloo (1978) suggest that language can take place when there is sufficient contact with speakers of that language. However PTD schools suffer a lack of sufficient people with English language skills. This therefore compounds the problem of easy development of second language skills by learners at such schools. English is not common to PTD communities, but it is used as a medium of instruction in these schools. In some instances teachers end up explaining concepts in learners' first language, with the intention of helping learners to make connections between the second language and the first language. The Department of Health and Human Science (2005) stresses that teachers should understand the process by which learners learn a second language. Because of the circumstances they live under, they do not have opportunities to learn the second language in an informal way. In order for teachers to understand their learners better, they should learn from families, not only about their children but also about the families' cultural, ethnic and linguistic backgrounds (Department of Health and Human Science, 2005).

At times, second language learners are often afraid to communicate in English because they feel incompetent. Thus, it is not uncommon for many of them to be labeled as having weak language skills. As a result, they may become withdrawn in school or appear inactive because they lose their focus when they do not understand what is being discussed. The research conducted by the New York University (NYU) child study center (2004) has shown that, many children with these difficulties become aware that they are not performing as well as others and they may withdraw or avoid academic challenges. It is therefore not appropriate to consider the levels of English first language learners and English second language learners to be the same. It must be accepted that SA still has a long way to go before education systems can be

equal. Moreover, technology can be very complex to any beginner, even for one with proficient English skills, and hence one can imagine the challenges facing a second language learner. Bruhns and Hoffman (2005) also describe the learning process of second language learners as often very complicated. "Firstly, learners construct their idea in their own language, then strain to think of the English L10N and thirdly, they struggle with the connection of words" (Bruhns and Hoffman, 2005).

It is therefore necessary, in the meantime, to explore solutions to the problems on hand. Language empowers individuals to decipher meanings and to respond to thoughts. Software L10N as a major resource can afford learners the opportunity to develop and value their first languages whilst learning computers with a greater level of understanding. In concluding this section, it can be said that in order to be proficient in computers in English, one has to be exposed to the language environment. In a study conducted by Cretchey (2005) on computer confidence, it was discovered that learners with low computer confidence felt threatened and disadvantaged in computer laboratories. Studies have shown that people feel comfortable when using their first languages. Therefore, an introduction of localised user interfaces can improve learners' confidence to use computers freely.

The literature collected in the above sections show a relationship between learners' language, culture and schools. However, with this knowledge, the chapter conclusion cannot be made prior to exploring the language acquisition process, as this will provide a clear understanding on language developmental stages and the environment in which language learning can take place.

2.2.2.4 The language acquisition process

The concept of language is generally understood as a medium, which people can use to interact in. Richards and Rodgers (1986) examine language as a vehicle for communicating meanings and messages and define acquisition as a process, involving the naturalistic development of language proficiency through understanding language and through using language for meaningful communication. According to Ellis (1994), conscious rules about a language are developed through learning. In many instances, an individual will have to go through formal education in order to learn a language. Williams and Snipper (1990) refer to language proficiency as "communicative competence". According to the authors, the term was originally coined by Hymes, (1972) to refer to people's pragmatic awareness of what constitutes an appropriate use of language in specific contexts.

The time it takes for anyone to learn a new language may vary from learner to leaner depending on age, motivation, and exposure to the new language. Several researchers addressed the issue of age as a factor that can affect the rate of learning and level of success. Hetherington (1980), Brown (1987), Williams and Snipper (1990), Ellis (1994) and the Department of Health and Human Science (2005), studied various aspects on this subject. The studies indicate that the developmental period for learning a new language is fairly consistent across young age. Work by the NYU, Child Study Center (2003), shows that as children grow, their language abilities develop automatically because they regularly listen to, and talk with members of their families. Moreover, parental understanding of a child's developmental processes plays an important role in any child's readiness for literacy.

In view of Information Technology education, lack of parental support in terms of technology can be a major drawback for many learners living in historically disadvantaged communities. Although, Burns, Griffin, and Snow's (1999) argument show that learning computers increases motivation in learners who are less likely to be motivated by parents, there is a greater possibility among these learners to be unprepared to participate in Information Technology education, because of the lack of knowledge at home.

As a result, these learners may become de-motivated in terms of wanting to engage in computer learning activities, as compared to English-speaking learners from more advantaged backgrounds who may have been prepared from an early age through home learning practices. Ellis (1994) suggests that a full explanation of the role played by motivation requires an account of how language acquisition affects the process of learning.

> "If their language is not accepted into the magic circle of technology, learners may feel personally rejected and second rated, and thus may never summon up the confidence to approach IT" (Yeo 1996).

Furthermore, an interview with Zulu (2005) reveals that a linguistically diverse SA creates unevenness in the levels of understanding English, which is the dominant language in the learning of computers. A study by Bruhns and Hoffman (2005) makes it clear that the educational progress of a second language learner is affected by language development. Language acquisition begins at a young age. Moreover, the influence on any child's upbringing is affected by the home or cultural background. Hence, education does not only remain in schools but also extends to homes. Cultural backgrounds and the country's history of PTD schools have made it difficult for learners to have exposure to a second language at an appropriate age. This is a problem that will remain with us for some time because of SA's

large population and its underdevelopment in many areas. Information Technology education does not have to be inaccessible. Wherever government or companies make use of computers regardless of how remote the region is, localised software is available and can be accessed at anytime. Localising software user interfaces is the most basic starting point, which any South African could do to speed up empowerment projects for PTD communities. If it can be done, as it is the case in this project, then it should be considered.

2.3 L10N initiative

Tholulwazi and Translate.org.za use free software for the L10N exercise as opposed to commercial software. Free software is cost effective, allowing users to take full advantage of what their computers can do. Some users refer to this software as "open source software". Souphavanh and Karoonboonyanan (2004) define this freedom as:

> "a door to escape from the limitations of the printing press, into a world where useful works, such as software, are developed among the users, by the users, for the users".

It has also been noted that the use of open source software is becoming increasingly popular, amongst developing countries. A good preparation of learners in the fields of languages and sciences together with free localised software and refurbished computers from sponsors can play a big role in increasing the knowledge of Information Technology education in the developing SA.

Software L10N research is labor-intensive. It requires extensive understanding of IT. However, the content of the thesis also feature linguistics and cultural discussions and their relative role to Information Technology education as highlighted in previous sections. The

primary goal of the study is to provide a dual computer software support for the KwaZulu-Natal second language community, particularly learners as they catch up and proceed with technology. When efforts are made to motivate learners to help them towards success, and to guide them in an environment which actively seeks to reduce anxiety, they generally do better at learning in a second language (Bruhns and Hoffman, 2005).

English, however, plays a major role in everyone's life. The idea of this research is not to discourage the use of English, but to find ways to promote the Computer Literacy of PTD learners by connecting the first language to the second language. A survey conduced for the current study at DUT on learners' performances in both first and second language user interfaces produced evidence that learners perform better in their first language. A recommendation drawn from the study is that both first and second language user interfaces of an education application software be installed in all computers to which beginning computer studies learners have access. Once learners become comfortable with familiarising themselves with the first language interface, they can switch to using a second language interface and later make the connections through the language. Studies conducted by Ellis (1994) and Ortiz (2005) have shown that second language acquisition is strongly influenced by the learner's first language and that the clearest support for this belief comes from 'foreign' accents in second language speech of learners.

> "Software translation into isiZulu does not remove all barriers to computer access and literacy, but it helps to eliminate a very important one" (Bailey, 2004).

Tholulwazi follows all software L10N standards, rules and rights set by Translate.org.za. All translated pieces of software are rechecked by hired professional translators and migrated into a full package by Translate.org.za before they are tested. Tholulwazi has very little

involvement on the highly technical processes and issues involved in putting the work together, as this is done in the office of Translate.org.za based in Pretoria.

2.4 Summary

It is extremely important that the language used in computer software at schools (where the teacher of a computer subject as well as the learner is a first language speaker) be the language that both learner and teacher can use with confidence.

The literature has shown that it is the experience and support any learner receives that serves as a primary focus of a guided initiation. For second language learners, Computer Literacy support does not only need to focus on computer concepts, but also in a language used in the user interface of a computer. A user interface of a program is the key to understanding a complicated tool such as a computer. Many South African companies like Telkom and banking institutions have ensured that their services are accessible to people in rural communities, for example, by ensuring that their interfaces or pre-recorded messages are available in different languages. The same initiative can be adopted in computer programs.

CHAPTER 3

SOFTWARE L10N PROJECT: TRANSLATE.ORG.ZA, THOLULWAZI

3.1 Introduction

This chapter begins with an introduction to open source software, which forms the core of the study. This chapter also discusses OpenOffice.org.za, which is an open source software product used as a research instrument in the study. Information on Translate.org.za, a free translating organization, is provided. These three areas lay the foundation for the rationale of this chapter, in which the actual localisation process is discussed.

3.2 Background to Open Source Software (OSS)

Increasingly, Open Source Software (OSS) is being introduced to many countries in an attempt to improve Information Technology education, especially in Previously Technologically Disadvantaged countries, who may have little or no funds to purchase commercial software. OSS are programs that are generated freely by volunteers and then made available to the public at no cost, and has been in existence since the early days of computing. According to Wheeter (2005), from approximately 1945 to 1975, computer programs like the UNIX source code were often shared amongst developers, just as OSS practitioners do today. However, due to the demand of the information era, commercial software took over the market, resulting in ignorance about the OSS initiative. Hence in 1985 Stallman established the free software

foundation to work to preserve, protect and promote free software, which later became the primary sponsor of the GNU project (Wheeter, 2005).

There are many other reasons why developers show an interest on OSS. According to Ganzalez-Barahona and Rables (2003), a free software project tends to be born as a result of purely personal action.

> "It starts with a developer who finds him/herself unable to solve a problem fully. The developer must have knowledge required to at least solve the problem. Once he/she has managed to get something usable ….. he/she then shares the solution with the free software community" (Ganzalez-Barahona and Rables, 2003).

Thus, the passion for developing OSS comes from within the developer's heart, based on his/her experiences in problem solving. Moreover, OSS has encouraged developers to pay attention to the development models and processes of free software engineering (Ganzalez-Barahona and Rables, 2003). Hence, OSS has a better error reduction strategy when compared to commercial software as errors are easily corrected and updates are instantly made available to the public. Additionally, the transparent environment of OSS provides an opportunity to localise software into a local language and culture.

A study conducted by the National Advisory Council on Innovation (2002) on the possible introduction of OSS in SA has shown that countries that are already using OSS make a better saving than the ones using only commercial software.

> "Like the governments of many countries… it is time for the South African government to promote the use of OSS and open standards in the country" (National Advisory Council on Innovation, 2002).

However, OSS has not fully materialised in SA due to a legal agreement between the commercial software company, Microsoft and the South African government, which enforces schools and other government sectors to use Microsoft products. However, the private sector has shown an interest in OSS by promoting its use within the business environment. OSS should be considered, as it will contribute towards the country's economy. Moreover, PTD learners could benefit from using OSS as it is available at no cost.

In a discussion with Information Systems learners at DUT, it was found that learners often become comfortable when using applications that share common features in the user interface. Thus, this project has selected OpenOffice.org.za, a product of OSS mainly because of its characteristics that are very similar to commercial productivity products used by the public. Moreover, OpenOffice.org.za includes products that are used on a daily basis such as a word processor, spreadsheet, presentations and drawings. Openffice.org.za is also made available in indigenous languages and can be used in multicultural institutions such as DUT, where the learner population is made up of a majority of second language learners (DUT, 2006).

3.3 Background to OpenOffice.org.za

This section provides an overview of the OpenOffice.org.za product and its flexibility that allows L10Ns to indigenous languages.

Adams (2001), the founder of the OpenOffice.org.za project, defines OpenOffice.org.za as both a product and a project.

> "The product is a cross-platform, open source office productivity suite, whilst the project is a worldwide community of contributors and users who participate in the development of the OpenOffice.org.za product" (Adams, 2001).

Moreover, OpenOffice.org.za is not a legal entity, but a community of interested and contributing parties within a non-profit organisation. The package includes the main applications such as a word processor (Writer), spreadsheet program (Calc), slideshow (Impress) and a graphics program (Draw). OpenOffice.org.za is a fully functional productivity software suite, compatible with Microsoft Office file formats as well as with operating systems including Macintosh, UNIX, Sun Solaris, Windows and Linux. The OpenOffice.org.za licensing model means that users are not required to pay licensing fees, thereby allowing people to make use of it free of charge.

The user interface and the functionality of OpenOffice.org.za is very similar to other products in the market like Microsoft Office, Lotus SmartSuite and Corel with the only difference being that OpenOffice.org.za can be obtained free of charge. Moreover, it can be modified to people's preferences. Thus, Translate.org.za, which consists of a group of volunteers aiming to develop translation tools and to localise OSS into indigenous languages, initiated a translation project to translate OSS into various indigenous languages of South Africa. This project (Tholulwazi) is part of the translation team and is focusing mainly on the isiZulu L10Ns. However, many other L10Ns have already been completed. A number of localised OSS products including OpenOffice.org.za, Mozilla, KDE and Firefox have been completed and released to the public. However, translation projects continue to take place on an ongoing basis due to new software releases and updates.

3.4 Background to Translate.org.za

This section gives an overview of the translating team and a brief history on some software products that have already been translated by the Translate.org.za community.

During an interview with Bailey (2004), the founder of Translate.org.za it was discovered that the translation project commenced in 2001. According to Martindale (2002), the translation project began with KDE, which is a graphical desktop environment for Linux and UNIX operating systems. The focus later changed due to the fact that it is not cross-platform, which means KDE cannot be used in other operating systems. KDE L10Ns include isiXhosa, isiZulu and Venda. In 2003, a complete version of Mozilla browser and the OpenOffice.org.za package was released in different South African languages to run on Windows, Linux and Mac platforms, making it easier for any computer user to install it and exposing a greater user base to OSS. The translation project has completed translating an Internet browser, FireFox. The FireFox translation was done using an online tool called Pootle. This online tool allows remote translators to contribute to the project easily without having to install software or even use Linux. According to Bailey in Martindale (2002),

> "free Software community conveys a spirit of cooperation and sharing, and after you have worked in the environment for a while and realise how much you have gained, you often feel compelled to contribute something back even if it is just a well-thought-out bug report" (Martindale, 2002).

The software L10N project takes place in the form of a translation event called a 'translate@thon' where programmers, translators, learners, the quality assurance sector and

others, gather together in one room to translate software. Section 3.5 discusses the localisation process.

3.5 Localisation process

In this next section, an overview of the translation events is discussed and the process of localisation is explained. Localisation is done in sessions. Some sessions are controlled in a closed room and some can be done individually from any remote computer. DUT has mostly been running closed sessions, also known as translate@thon, which will be discussed next.

3.5.1 Translate@thon

A translate@thon is a multistage event that encourages participants to localise computer terms from English second language into indigenous languages within a limited timeframe. The DUT's Department of Information Technology, where this study is being investigated, hosts translation@thons on a regular basis as an outreach programme for communities that are passionate about localising software interfaces into the isiZulu first language. The Department of Language and Translation at DUT is also a part of these events. Thus, the Language and Translation Department performs L10Ns and ensures quality in the first draft L10Ns. Other quality measures are discussed in the next section on the L10N process. All translate@thons are run in fully networked, fast access computer laboratories. The translation events usually take a full day.

During L10Ns, IT experts provide clarity on computer terms, whilst the translators and terminologists do the actual translation. A translate@thon starts with initial translations, followed by a comparison of isiZulu translations to English. Necessary adjustments are done during the process. Once the translations are completed for the day, the team gives feedback on the session. All noted comments and suggestions are exercised in the coming events to improve the quality of work. The next section provides a technical aspect of these translations. The software L10N process is crucial for the study as it reports the true events on translations therefore distinguishing the field of the study.

3.5.2 Technicalities of the software L10N process

Software L10N involves a variety of specialists, such as programmers, translators, L10N engineers, quality assurance specialists, project managers, users and interested community members. Software L10N does not only involve a smooth procedure of each task but also the coordination of a L10N team. Without specialised L10N tools, L10N can be extremely difficult and time consuming with a lot of redundant data and errors. In general, L10N tools are highly specialised applications for the L10N of software. L10N can take place when there is a source code. OpenOffice.org.za is developed from free source code. Translate.org.za has a project called WordForge that attempts to simplify the process of L10N of software.

According to Bailey (2005), the WordForge project uses standard data formats (Portable Object Files (PO), Localisation Interchange File Format (XLIFF)) and process data to improve the efficiency of translators. Moreover, to keep tight control of technical aspects of translation. WordForge uses a Translate Toolkit and Pootle for translations. The project is designed to

enhance these tools so that they are more compliant with the Localisation Industry Standards Association (LISA) standards.

Translate Toolkit is used to convert between various different translation formats (such as gettext-based .po formats, OpenOffice.org.za formats, and Mozilla formats). This makes it possible to stay in one format across all L10Ns. According to Bailey (2005), Gettext is a set of tools used primarily on Linux and UNIX computers that makes a program translatable. PO files are produced by xgettext (cf.) that a translator translates into isiZulu. These files are compiled using Gettext (cf.) tools into Machine Object files (MO), which are much quicker for a computer to read than PO files.

Pootle is a simple web portal that allows remote volunteers to translate software online using passwords to access the glossary from the web server. During L10Ns, computer experts provide the explanations of the computer terms as well as assist with technical problems that are experienced during the process. However, there are online technical dictionaries that can be used such as dict.org, foldoc and Wiktonary. A Pofilter tool can be used to detect errors which may become problematic. Common errors include capitalisation, double words, variables, punctuation, accelerators and HTML tags. Once corrections are made in the Pofilter, they can be merged into existing translated POfiles using POmerge. However, more checks are done by freelance translators and they are then rechecked and tested before the product is released. Other highly technical processes involved in the L10N process are obtainable on the Translate.org.za website, following the links to the sourceforge project.

3.6 Summary

It has been noted many times that South Africa is a multicultural society. According to the National Advisory Council on Innovation (2002), this is a logistical nightmare when it comes to communicating decisions and policy to the nation. As a result of the multicultural society, second language learners lack English skills, which are utilised in many software products developed throughout the country. It is believed that most of the South African population is excluded from computer technology, simply because they do not have the required language skills. However, the language support problem does not arise in a country that is entirely English speaking. A solution could be to improve second language literacy.

It has also been found that there is very little commercial interest in multilingual products. Furthermore, the packaged software market uses inflexible proprietary standards that do not make it easy for users to add their own enhancements. However,

> "…it should also be acknowledged that providing language software is both possible and simple" (National Advisory Council on Innovation, 2002).

Software L10N is a complex yet interesting project. Moreover, it should be noted that translating software into a local language does not remove all barriers to Information Technology education, but it does help to eliminate a very important one. According to Martindale (2002), an interview with Bailey has revealed that localising together with low cost computers will go a long way towards a making a dramatic Information Technology impact on South Africans, especially the technologically disadvantaged.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This chapter provides an analysis of the methods used and a motivation as to why they were preferred for the study. The chapter begins with a discussion on the approaches as well as the research method followed by data gathering methods.

4.2 Research approach

This is a case study and it uses a qualitative research approach as opposed to a quantitative approach. Qualitative research is described as "the non-numerical examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships" (Casebeer and Verhoef, 1997). Quantitative research, on the other hand, is defined as "the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect" (Casebeer and Verhoef, 1997). In a qualitative approach, the researcher is the data-gathering instrument whereas in quantitative approach, the researcher uses tools or equipment to collect numeric data (Neill, 2004). According to Fitzgerald (2000),

> "…when it comes to dealing with a large sample size, quantitative research reaffirms the axiom 'bigger is better'. Yet when it comes to dealing with smaller, more focused samples, qualitative research proves that 'size doesn't matter'".

Thus, Neill (2004) recommends that a qualitative approach should be used in the earlier phases of research and in the later phases quantitative research can be used. According to Casebeer and Verhoef (1997), quantitative research is usually linked to the notion of science as objective truth or fact, whereas qualitative research is more often identified with the view that science is lived experience and therefore subjectively determined. However, Neill (2004) feels that qualitative data is more time consuming and less able to be generalised compared to quantitative data, which is more efficient. Irrespective of any approach Casebeer and Verhoef (1997) view qualitative and quantitative methods as part of a continuum of research techniques, all of which are appropriate depending on the research objective.

This research deals with a subject that has not been researched much in the past**.** A qualitative approach produces more in-depth, comprehensive information, as it deals with how people understand their experiences. A more in depth focused approach is therefore required to highlight problematic areas and, thus, this study uses a qualitative approach as it was considered to be more appropriate.

4.3 Research method

This study is a case study in the field of Information Technology, which uses language as a variable in the software L10N. The use of case studies is the most common qualitative method used in information systems (Myers, 1997). Although there are numerous definitions, a case study can be defined as a form of qualitative research that is focused on providing a detailed account of one or more cases (Johnson and Christensen, 2003). Yin in Buttaro (2004) defines the scope of a case study as an empirical inquiry that investigates a contemporary phenomenon

within its real-life context, especially when the boundaries between phenomenon and context are not evident. Thus, a case study method is used for this research as it offers a method of learning about a complex instance through extensive description and contextual analysis. Moreover, the product articulates why the instance occurred as it did, and what one might usefully explore in similar situations (Johnson and Christensen, 2003). In the case of this study, four groups were studied. The groups consisted of learners at secondary level, a group of 1st year Information Technology learners at a tertiary level, a group of SACTWU adult learners and a group of 1st year Development Software at a tertiary level.

4.4 Data gathering

The study used samples from two different levels of study. The first sample was drawn from a sample frame of PTD high schools in KwaZulu-Natal and was used as a pilot study. A second sample as well as a fourth sample was drawn from a sample frame of first year Information Technology learners at the Durban University of Technology (DUT). Additionally, a third sample was drawn from the DUT, South African Clothing Textile Workers Union (SACTWU) adult short course. However, results from this sample could not be used directly in calculations, as there were major problems associated with education literacy in general. Nevertheless, the findings of this sample are recorded as a matter of concern, where the majority of English second language computer illiterate adult learners are expected to become computer literate within a short period of five days. It was also discovered that the working conditions of these learners do not provide for the usage of computers.

Other participants, for instance lecturers and Bachelor of Technology (B-Tech) research learners, tested the validity of instruments by assisting in testing questionnaires and control tests.

4.5 Selection process

4.5.1 Schools' selection

The study was limited by the budget and for this reason, only schools near the greater Durban area were selected.

For the purpose of this study, technologically and historically disadvantaged schools are characterised as follows:

1. All learners in a school are Black Africans.
2. English is offered as a second language.
3. English acquisition is believed to be a problem for many learners.
4. Both English and isiZulu are used as medium of instruction.
5. There are very few computers which are shared amongst many learners.
6. Computer teachers are not very Computer Literate.
7. Computer equipment is not up to date.
8. There is no immediate technical support.

The schools selected, each had to have at least four (4) of the above-mentioned characteristics, present.

4.5.1.1 Schools sampling method

Due to the problems encountered as a result of some schools being unaware of the importance of Information Technology education, as well as the issue of distance, it was decided that the study should use a new method of sample selection. The method uses a traditional compass that is used in geographical studies (see figure 4.5). The compass was placed on the map of KwaZulu-Natal province to identify directions or routes to nearby schools outside Durban, matching the criteria. By using a compass method, it is hoped that the study would limit the biases and influences of the similar mindset and behaviors of a specific group of people.

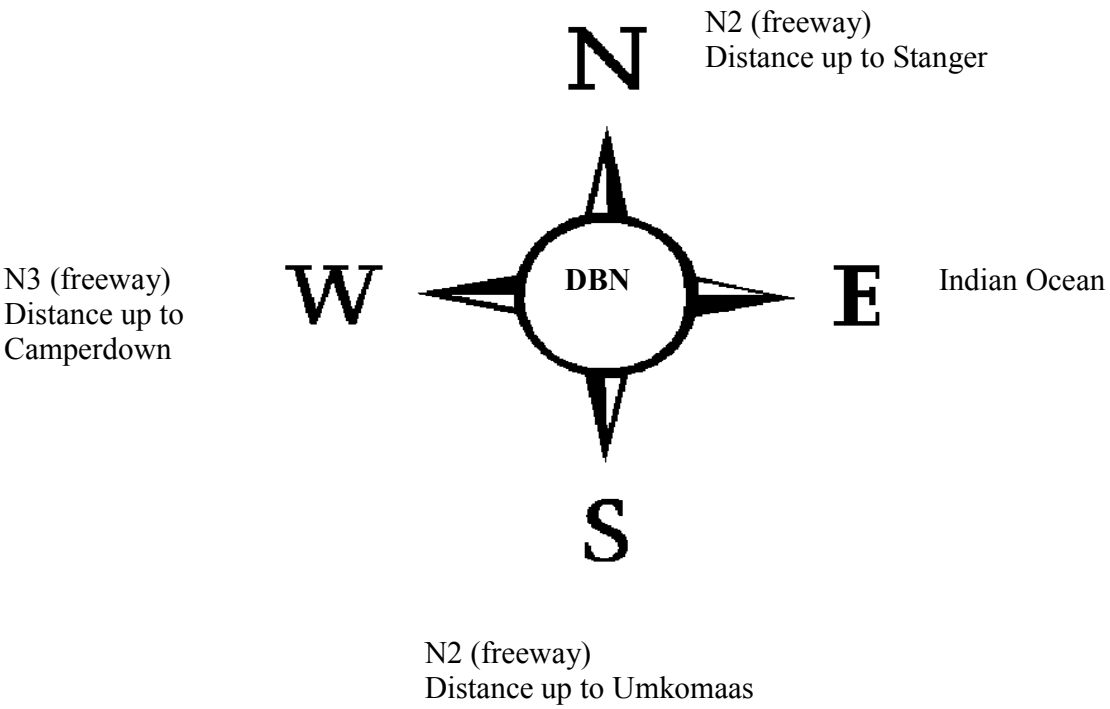


Figure 4.5: Identification of schools using a compass

In figure 4.5, Durban (DBN) is recognized as the centre of a compass. From Durban, all exit routes to national roads (N2 north and South, and N3) are identified and used as pointers to schools situated in those areas as pointed out by the direction of the compass. The East pointer, which points to the Indian Ocean, is not used.

4.5.1.2 Schools sampling size

Forty (40) schools along the regions specified on the compass were listed. Each school in the list was contacted. Principals of seven (7) schools rejected the study, another 20 schools were amongst schools that did not have Computer Literacy teachers and therefore did not have learners studying computers, some schools did not have electrical power and in many instances as well, computers were reported missing. Some schools provided telephone numbers that were non existent and they, therefore, could not be contacted. Ten (10) schools, three from each direction and the 10^{th} based in Durban, were happy to be visited. A two-week plan was timetabled for the ten schools, with a day's visit set aside for each school. Before the visits, computer teachers of the schools to be visited were contacted and very informal questions relating to the condition of computers and amount of the syllabus work that would have been covered at the time of the field study were asked.

4.5.2 DUT (IS1) first selection

4.5.2.1 DUT (IS1) sampling method

The sample selection of learners at DUT focused on first year Information Technology students from Groups F and G. These two groups were identified as lower level groups according to the IT department groupings, which was based on the students' matric results. The selection was done using a convenience sampling method, where learners were informed about the project in a formal lecture and invited to attend.

4.5.2.2 DUT (IS1) sampling size

The number of learners who responded to the request to participate in the project was much lower than expected. However, it should also be noted that there are a fair number of black learners in the institution who are not native isiZulu first language speakers. Moreover, some isiZulu first language learners matriculated at ex-Model C schools, which are English-Medium based schools, and hence they do not have a language problem. The aforementioned may have contributed to the much lower number of students participating in the project than anticipated. It is however, appreciated that 35 learners from a total of approximately 120 showed an interest in the project and agreed to participate.

4.5.3 SACTWU selection

4.5.3.1 SACTWU sampling method

SACTWU is the South African Clothing and Textile Workers Union. Yearly, the union sends its members for short courses. One of the short courses is a Computer Literacy course. The SACTWU branch in KwaZulu-Natal usually uses DUT as the servicing institution for the Computer Literacy course.

The short course takes five (5) days, and adult learners are expected to have completed work on computer basics, word processing, spreadsheet, presentation and the internet. Assessments on each of the applications are done within the 5 days. The class consisted of 38 adult learners of different races (Indian, Coloured and Black).

The selection was done using a convenience sampling method, where learners were informed about the project in a formal lecture.

4.5.3.2 SACTWU sampling size

About sixteen (16) learners responded to the request, which was a 100% response rate of all the Black African learners from the class.

4.5.4 DUT (DS1) second selection

4.5.4.1 DUT (DS1) sampling method

The second DUT sample was drawn from a class of Development Software 1 (DS1) learners in the department of Information Technology. Development Software 1 is one of the programming subjects offered in the first year of the National Diploma: IT. Development Software and Information Systems are major subjects in the National Diploma: IT. This means that learners carry both subjects up to the third level of study. Information Systems 1 (IS1) as described in previous sections, consists of a theory section and introduces learners to the basic Computer Literacy programme. Development Software 1 however, is largely based on logic and problem solving, which introduces learners to a programming environment. According to DS1 subject lecturers, many learners find it difficult to adapt to a programming environment. Thus, learners see DS1 as a highly challenging subject compared to IS1.

4.5.4.2 DUT (DS1) sampling size

The Department of Information technology enrols a minimum of 300 learners for DS1 every year. Learners are divided into groups of a maximum of 60 each, depending on the intake. Five DS 1 groups out of eight groups, (C, D, E, Part Time A and Part Time B) were selected as a second sample for this research. The selection was done based on the number of isiZulu speaking learners per group as well as the first language of the group lecturer. Therefore, all five selected groups were taught by isiZulu first language lecturers. A small number of English first language learners from these groups were swapped with isiZulu first language

learners from the remaining groups A, B and F. The total number of all learners selected was two hundred (200). All these learners are English second language learners whose first language is isiZulu.

4.6 Research instruments

Various instruments were utilised across the qualitative approach in the study. According to Melville and Goddard (1996), the design of an instrument for collecting data requires careful planning. Thus, the study used both direct and indirect methods of measuring data. According to Bryman in Dalvit (2004),

> "…the direct methods address the subjects involved directly and seek to elicit an explicit response to a clearly defined question" (Dalvit, 2004).

However, Dalvit (2004) also agrees that direct responses do not assess the underlying unconscious dynamics. Hence, indirect methods are more useful to explore unconscious phenomena.

The study uses a combination of questionnaires and computer tests methods. Melville and Goddard (1996) define a questionnaire as a printed list of questions which respondents are asked to answer. This study uses a written form questionnaire.

Discussions were also held with various people including experts in the field of IT and language, teachers, learners and the members of the community. All responses from the discussions were noted. The information from these discussions assisted greatly in contributing towards a wider understanding of the problem.

Table 4.6 below, summarises the instruments used in each of the samples selected, more details on each of the instruments are discussed in section 4.6.1.

Table 4.6: Research instruments

Schools Pilot Study	**DUT (IS1)**	**DUT SACTWU**	**DUT(DS1)**
Demonstration	Pre-questionnaire	Demonstration	Pre-Questionnaire
Product Exploration	Pre-test	Questionnaire	Chapter 1
Questionnaire	Post-test		Chapter 2
Video camera (general attitudes)	Post-Questionnaire		Test
			Post-Questionnaire

4.6.1 Instrument analysis

Three instrument analysis tools were used in the study: a spreadsheet for the pilot study, a trial version tool called Statpac for the DUT (IS1) sample and Waikato Environment for Knowledge Analysis (WEKA) data mining tool for the DUT (DS1) sample.

4.6.1.1 Statpac & Ms Excel spreadsheet analysis

The Statpac trial version suited the analysis of the DUT (IS1) sample as it allowed 38 entries. Moreover, the availability of pre-coded formulas and functions contributed to the user friendliness of Statpac. Each question was considered a separate item and analysed

independently to provide clarity. The tool operates by first accepting the questionnaire information including the questions and possible answers. All answers are computed following the order of the questions and choices selected by each participant. Statpac also provides an option to analyse the results once all data have been entered. The tool increments the total for each answer by 1 for every answer selected. For instance if 5 participants all agree that they speak isiZulu, (given choices agree, disagree and don't know), the tool will start from 0 and keep on incrementing the total for choice "agree", and will not use other choices "disagree" and "don't know". At the end of the analysis, Statpac will provide the number of participants who responded to each of the choices and will provide percentages and an overall mean. In the given scenario, the number for the first option, "agree", will be 5, and 0 for both "disagree" and "don't know". Therefore, the overall percentage will be 100% for this question. In a situation where a response is not given in a question, the analysis automatically increments the "don't know" field by 1.

The same method is used in multiple-choice questions, where respondents are allowed to select more than one choice. However, the percentage may not necessarily be 100% as in other questions with only one choice. For instance, considering the pilot study of 150 respondents, if a respondent selects three (3) choices in one question, then each of the choices will be incremented by one. Suppose another respondent decides to select two (2) choices for the same question, adding the value of responses in the question to 5 (3+2) only for two respondents. If the remainder (148) choose 1 choice each, then the total responses for that question would be 153 out of 150 respondents and the resulting percentage would be 102.

The same technique was applied across all samples. For the schools sample (pilot study), however, a spreadsheet application was used to analyse the results as there were 150 respondents and the Statpac trial version only allows a maximum of 38 entries. This method required formulas and functions to be written by the researcher to achieve the results, unlike the pre-coded formulas and functions provided in Statpac.

4.6.1.2 WEKA data mining software

A WEKA data miner version 3.4.10 was used to analyse the DUT (DS1) results. Weka is free open source software under the GNU's Not Unix, meaning open source software that is not Unix (GNU) General Public License (GPL). Weka was developed at the University of Waikato in New Zealand. The acronym WEKA, was coined by Geoff Holmes and its file format "ARFF" was created by Andrew Donkin. ARFF was rumored to stand for Andrew's Ridiculous File Format. Witten and Frank (2005) define WEKA as a collection of machine learning algorithms that support the whole process of experimental data mining.

Thearling (2007) defines data mining as the automated extraction of hidden predictive information from databases. Data mining, which is also known as Knowledge-Discovery in Databases (KDD) or Knowledge-Discovery and Data Mining, searches large volumes of data for patterns using tools such as classification, association rule mining, clustering, and others. Technically, data mining is a process of finding correlations or patterns among dozens of fields in large databases. Association rules is one of the ways that finds these patterns. These rules discover elements that co-occur frequently within a data set consisting of multiple independent selections of elements, and to discover correlation rules, which relate co-occurring elements.

According to Rob and Coronel (2007), a data set is a collection of data, usually presented in tabular form. Each column represents a particular variable or attribute, and each row is an assignment of values for each of the variables (record) to a member of the set in question. Questions such as "if a student passes Information Systems 1, how likely is he to pass Development Software 1?" and "What subjects will a student pass if he passes Information Systems 1 and Development Software 1?" are answered by association-finding algorithms. This application of association rule is also known as market basket analysis. As with most data mining techniques, the task is to reduce a potentially huge amount of information to a small, understandable set of statistically supported statements. For this reason, WEKA was selected for the DUT (DS1) sample, in order to find a correlation between the medium of instruction and the performance improvement of English second language learners in the subject concerned.

4.6.1.3 Ms Excel format for WEKA

All data obtained from the DUT (DS1) sample was captured into a Microsoft Excel spreadsheet. Each variable was captured in a separate column. For example, the Group Identification was captured first, followed by a Student Number, Surname, Pre-language perception, Chapter 1 language, Chapter 2 language, Test results, Post-language perception, DS 1 course mark and the Progress. The Progress variable was obtained from the IF analysis used to compare the test results obtained from the study to the DS 1 course mark. Student records were captured according to the defined variables and the Progress variable automatically added its value. Values captured within this variable are Stable, which was applied if the results from the study did not change; Better, if the results from the study

improved; and Worse if the results from the study were poor. A spreadsheet file was then formatted for data consistency, correct use of special characters and conversion of numeric fields to text. For example, WEKA cannot read a hyphen (-) but can read an underscore symbol (_), and the same applies to numeric values, it can only understand the written words, for example, it cannot understand the number 1, but it understands the word one. All results in percentages were converted applying the grading used at the DUT. For example 75% and above was converted to A, 65% -74% to B, 55% - 64% to C, 45% - 54% to D, 35% - 44% to E, 25%-34 to F and any value below 25 was converted to FF. The Microsoft Excel File was then converted to a Comma Separated Value (CSV) file format for WEKA compatibility and readability. From the WEKA data miner, the Explorer Graphical User Interface was selected. From the menu, the CSV file was loaded with all its pre-defined variables from Excel. However, variables can be removed, selected and deselected accordingly. An association (correlation) between variables was then traced using the Apriori algorithm as an associater within WEKA.

4.6.1.4 The WEKA Apriori Algorithm

Apriori is a classic algorithm for learning ***association rules***. The algorithm attempts to find subsets which are common to at least a minimum number C (the cutoff, or confidence threshold) of the item sets. Apriori uses a "bottom up" approach, where frequent subsets are extended one item at a time (a step known as candidate generation, and groups of candidates are tested against the data. The algorithm terminates when no further successful extensions are found. Apriori counts candidate item sets efficiently using its search algorithms. Below is the Apriori algorithm according to Manilla in Wekipedea (2007).

- Find frequent set L_{k-1}.
- Join Step.
    - C_k is generated by joining L_{k-1} with itself
- Prune Step.
    - Any (k − 1) -itemset that is not frequent cannot be a subset of a frequent k -itemset, hence should be removed.

where

- (C_k: Candidate itemset of size k)
- (L_k: frequent itemset of size k)

Apriori Pseudocode

Apriori (T, ε)

$L_1 \leftarrow \{$ large 1-itemsets $\}$

$k \leftarrow 2$

while $L_{k-1} \neq \varnothing$

$C_k \leftarrow$ Generate(L_{k-1})

for transactions $t \in T$

$C_t \leftarrow$ Subset(C_k,t)

for candidates $c \in C_t$

$\text{count}[c] \leftarrow \text{count}[c] + 1$

$$L_k \leftarrow \{c \in C_k | \ \mathrm{count}[c] \geq \varepsilon\}$$

$$k \leftarrow k + 1$$

return $\bigcup_k L_k$

Figure 5.1: Apriori psedo code showing the algorithm

The DUT (DS1) rules from the Apriori algorithm are discussed in section 5.4.4.

4.6.2 The questionnaire

Various definitions are available on questionnaires. Barruto (2004) defines a questionnaire as a way of obtaining data about people by asking them rather than observing their behavior. Melville and Goddard (1996), suggest that a questionnaire should be made short and must not abuse the respondents' time or concentration. Moreover, it should be structured in such a way that it gets all the data needed by making it precise and unambiguous with relevant understandable questions.

The study used a program called Statpac[1] and a spreadsheet to analyse the questionnaire results. Each question was considered a separate item and analysed independently to provide for clarity.

[1] Statpac for Windows v 10.1 is the research software created by David Walonick. The software allows for the design of the study, collects the data and runs the analyses.

Two questionnaires were used in the study. Both questionnaires were tested for clearness by both English second language lecturers and B-Tech learners from the Department of Information Technology at the DUT. The first questionnaire was used for the pilot study conducted at schools, the DUT first sample (IS 1 learners) and the SACTWU sample. The second questionnaire was used for the DUT second sample (DS 1 learners).

The first questionnaire used in this study was adapted from the work conducted by Dalvit (2004) on the attitudes of isiXhosa speaking learners at the University of FortHare towards the use of isiXhosa as language of learning and teaching. Dalvit's questionnaire seemed appropriate and relevant, especially the sections on languages. However, the questions on Information Technology education were especially formulated for this study by the researcher (see appendix A and B).

The first questionnaire consisted of five pages and was made available in both English and isiZulu in order to provide a clear understanding of what is required from the participant. The wording of the isiZulu questionnaire was made slightly different to the English questionnaire so as to avoid the loss of meaning in the translations. A clear introduction to the questionnaire and its purpose was given on the first page. The questionnaire consisted of 17 questions and took approximately 10 to 15 minutes to complete.

All isiZulu translations were initially done by the researcher, carefully taking time to analyse statements. The questionnaire was edited by a specialist in the Department of Language and Translation at the DUT. The questionnaires were pilot tested within the Department of Information Technology at the DUT by both isiZulu first language learners and lecturers. Pilot

testing was done prior to the actual data collection by eleven (11) English second language learners and four (4) English second language lecturers in the Department of Information Technology. A few adjustments were made after the pilot testing, after which the questionnaires were distributed.

The second questionnaire consisted of only one question. This questionnaire captured the language perception on learners before and after the introduction of a dual-medium instruction.

4.6.3 Validity of questions

The study uses closed-ended or structured questions in the questionnaires as they seemed appropriate for the context. It has been discovered that the choice of questions is important in obtaining the correct data. According to Dalvit (2004), some questions are about subjective experiences to the beliefs, attitudes, feelings and opinions of the respondents. However, attitudinal questions are difficult to measure, as some respondents are not aware of their own attitudes or are negative towards a discussion.

Melville and Goddard (1996), provide a distinction between open-ended and closed-ended questions. Open or unstructured questions can be used to get a feel for the subject. Here respondents are free to express themselves fully and in detail on a given topic (Dalvit, 2004, Melville and Goddard, 1996). However, open questions are difficult to answer as they sometimes reflect differences in verbal abilities, thus obscuring the issues of interest. With closed or structured questions, on the other hand, respondents choose from a set of alternatives, thus making them easier to answer. Dalvit (2004) warns that closed-ended questions may

introduce bias, where important answers may not be included, or irrelevant answers are provided.

4.6.4 Administration of questionnaires

Six hundred and thirty six (636) questionnaires were administered in four formal stages/rounds.

4.6.4.1 First stage

In the first formal stage, a pilot study of one hundred and fifty (150) questionnaires were distributed during the period of October and November 2004 to ten (10) Previously, Technologically Disadvantaged black schools in the KwaZulu-Natal province. Each school was paid a visit and the administration of the questionnaires was done during these visits. Prior arrangements were made with the KZN Education Department, the district offices, and the principals of schools involved (see appendix G: permission letter), seeking permission for the visit and for the administration of the questionnaires.

Principals identified classes where Computer Literacy lessons were being taught, which were mostly grade 11 and 12 classes. However, it was also discovered that Information Technology education was not a formal matric requirement because of the shortages of technology resources in these schools. Thus, most learners did not show an interest in the project, as they were not actively involved in Computer Literacy. For this reason, each principal or delegated teacher extracted a convenient sample of interested learners to attend a research meeting on the appointment date scheduled with the school. The meetings took place in the classrooms and

sometimes in a computer laboratory. Discussions were opened after sessions and general constructive comments were captured on a digital video camera for later review. However, it was also noted that some responses could be biased as some people may become conscious of the camera and, may either not want to express their true feelings, or may become overly expressive as a way of performing for the camera.

Sessions began with a thirty-minute presentation (see section 4.6.5 for presentation details) of OpenOffice.org.za software, followed by a twenty-minute demonstration and an hour of product exploration. During this hour, learners were asked to gather around the tables where there were two laptop computers displaying the product. Learners were given an opportunity to navigate isiZulu interface of OpenOffice.org.za software with the assistance of the DUT project helpers who volunteered to be a part of these visits.

The formal sessions resumed for questionnaire completion, which took approximately fifteen (15) minutes. An explanation of concepts was provided prior to filling in the questionnaire. It was deemed important to first explain the process, as learners sometimes experience problems in understanding what is required of them. Approximately 80% of the questionnaires that were returned were completed in isiZulu, and 20% were completed in English. All hundred and fifty (150) questionnaires were returned as they were administered in a controlled environment.

After the questionnaire process, learners were asked to reflect on their general attitudes towards the isiZulu interface of OpenOffice.org.za application in an open environment. The

responses were captured randomly on video and later analysed and translated into English for the formality of the thesis (appendix D).

4.6.4.2 Second Stage

In the second round of questionnaire administration, 35 questionnaires were distributed to 35 Information Technology first year learners studying Information Systems 1 at DUT, in April 2005. In the Department of Information Technology, learners are categorised into groups based on their performances in matric and in the IT entrance test. Thus, lower groups tend to have learners who tend to struggle in the beginning. However, they become better as the year progresses. The first sample was drawn from a sampling frame of 120 Information Systems 1 multicultural learners, from Groups F and G, which are considered the lower groups according to the IT Department categorisation.

The second stage questionnaire was done in two further stages. The first stage, which was a pre-test questionnaire, was done before the computer tests. After the tests, the same questionnaire was administered as post-test questionnaire to measure the attitudes of the respondents after they had been tested on the isiZulu software. The same questionnaire was used in the pre and post-test questionnaire session (see appendix A and B). The respondents, however, were guided to respond only to highlighted questions, which were more focused on the dual-medium Information Technology education.

Questionnaires were distributed on the date of appointment that was pre-arranged with the participants. The meeting commenced with a presentation, followed by a demonstration,

software exploration and questionnaire filling-in process. Each participant was given two copies of the pre-test questionnaire. 60% of the English questionnaires and 40% of the isiZulu questionnaires were returned completed. The pre-test questionnaire was followed by computer tests (see section 4.7 DUT computerised tests). Thereafter, a post-test questionnaire was done in May 2005, and this time 30% of the English questionnaires and 70% of the isiZulu questionnaires were returned. These repeated tests were specially done on this sample as it was deemed appropriate to use them, after considering their Computer Literacy levels at the time of measurements.

The total number of all questionnaires distributed in the second stage of the DUT (IS1) sample was seventy (70), including the pre and post-test questionnaires. All 70 questionnaires were returned, as they were administered in a controlled environment.

This added a lot more input to the study as the evidence needed to select a sample was already known. According to Yin in Buttaro (2004),

> "the most important advantage presented by using multiple sources of evidence is the development of converging lines of enquiry, a process of triangulation" (Buttaro, 2004).

For this reason, observations according to Yin, found that conclusions and findings in a case study are likely to be more convincing and accurate if they are based on several different sources of information.

4.6.4.3 Third stage

In the third round of questionnaire administration, sixteen (16) questionnaires were distributed in November 2005 to the class of South African Clothing Textile Workers Union (SACTWU) Computer Literacy adult learners. The course is not a requirement for their work, but is part of the skills development process introduced by the South African government. The short course takes five (5) days, in which the adult learners are expected to have completed work on computer basics, word processing, spreadsheet, presentation and the internet. Assessments on each of the applications are done within the 5 days. However, many problems were encountered in the process, as some of these learners had left school 30 years ago and some had not completed matric. The programme used a Microsoft package as per the agreement between SACTWU and DUT. Thus, OpenOffice.org.za software could not be used to teach these learners. However, this created endless problems as many of these learners were Black Africans who have difficulty reading English. At least 90% of the time, the lecturer had to provide isiZulu translations for the learners to understand.

On the fifth day, a quick demonstration of the OpenOffice.org.za isiZulu interface was done and learners were generally asked to give their comments on the software. This, however, led to an outpouring of dissatisfaction over the way the course was conducted as learners felt they were denied access to what could have been a solution from the beginning. In view of the above, learners recommended that the isiZulu software should be considered for the next course.

Learners were asked to complete the questionnaires at their own time and return them to the union head office within a week. However, only three questionnaires were returned, and they were not fully completed as well. Thus, the results obtained from the SACTWU sample could not be included in the final analysis as they would create uneven results, but valuable insights, which are discussed in chapter 5, were gained and therefore it was decided to mention this session of data gathering.

4.6.4.4 Fourth stage

The fourth sample was selected specifically to enable correlations to be investigated. The first questionnaire identified opinions and perceptions, while the second questionnaire provided the basis for investigating the correlations identified in section 1.3.3 namely; Learning first in isiZulu then in English improves the learners' understanding of the subject matter.

In the fourth round of questionnaire administration, 400 questionnaires were distributed to 200 DS 1 learners in two stages. The first set 200 questionnaires was administered before the experiment (pre-test) and the second set of 200 questionnaires was administered after the experiment (post-test). The process took place in May 2007. Both questionnaire sets captured the language perceptions of learners. Five choices of the IT medium of instruction were listed in the questionnaire as follows:

- English Only
- IsiZulu Only
- English then IsiZulu
- IsiZulu then English and

- Mix (interchangeable)

The questionnaire was given to all selected groups. Each of the five groups selected was taught in each of the selected choices. The work was divided into two chapters. Chapter 1 was based on the section on Procedures and Chapter 2 was based on the section on Functions. Each group was taught according to the language preferences listed above. For example Part Time A was taught in English only, Part Time B was taught in isiZulu first and then in English, Group C was taught in isiZulu only, Group D was taught in both isiZulu and English (mixed) and Group E was taught in English first and then in isiZulu. At the end of it all, all groups had learnt the same content of the syllabus but through the medium of different languages.

According to the syllabi, Procedures form a foundation of Functions. In other words, learners need to be first exposed to the way procedures work before they can be introduced to Functions. Each chapter was taught in a week comprising of 6 DS1 periods per week. Learners were thereafter given a theory test, which was based on the two chapters. Thereafter they were given the same questionnaire, which captured their perceptions after they had been exposed to the dual-language medium. Both questionnaires and tests were written using English second language, see appendices I & J.

4.6.5 The presentation process

This section discusses the presentation process followed in both the schools and DUT. The session started off with an introduction, followed by a PowerPoint presentation of 15 slides. A detailed slide show is attached in appendix F: Presentation Process.

Slides are summarised as follows:

- Slide 1: discussed the background of the project, what it is and how it started.
- Slide 2-slide 6: discussed similarities of the OpenOffice.org.za suite with other application suites and the new features of the OpenOffice.org.za software suite.
- Slide 7: discussed hardware requirements for installing the OpenOffice.org.za software.
- Slide 8-12: demonstrated screens of the OpenOffice.org.za suite including the following: a word processor, spreadsheets, presentations and a drawing package.
- Slide 13-slide 14: discussed advantages of the OpenOffice.org.za software.
- Slide 15: concluded with a thank you message.

The presentation was followed by a demonstration on the OpenOffice.org.za word processor, where English and isiZulu interfaces were demonstrated. A draft document was also produced using both interfaces. Formatting options on a document such as Bold, Italics, Underline, Font, Size, Background and Pictures, were used. Options such as Save, Open and Close were also demonstrated. After the demonstration, learners were given the opportunity to explore the

isiZulu OpenOffice.org.za interface which was then followed by general questions and answers on formatting options (see appendix E: Revision questions). In the last session, views that were expressed were captured on digital camera (refer to appendix D: General Responses). All participants received incentives for taking part in the study.

4.7 DUT (IS1) computerised tests

This section provides information on the methods used to measure the learners' understanding of both isiZulu and English OpenOffice.org.za interfaces. The measurement instrument was made available in both isiZulu and English. Both pre-test and post-test methods were used.

A pre-test is given to the subjects of a research study before the study begins. According to the London Metropolitan University (LMU) Association of University Teachers, a pre-test is designed to indicate which parts of a teaching programme a candidate already has competency in. On the other hand, a post-test is given to the participants of a research study after the study has been completed. This test indicates which competencies have been achieved.

4.7.1 DUT (IS1) pre-test

A pre-test session was done on the second sample, the DUT (1S1) learners' in May 2005. Learners had already been exposed to a word processor, and, thus, the second language learners' Computer Literacy levels prior to the pre-testing, were known. The pre-test was based on the English OpenOffice.org.za Writer, which is very similar to Microsoft Word.

Six (6) computers were used. All 35 learners were given a practical test on the English interface of OpenOffice.org.za. The test was done in six sessions, 30 minutes each, with a ten minute break between the sessions. (The test was obtained from the DUT, department of Information Technology, which was used in previous word processing assessments (see appendix C)). Learners were instructed to store the work on a local disk. The tests were marked and the results are shown in appendix H: Computer test results. After the pre-test, learners were given a week to familiarise themselves with both interfaces. Each learner was given a 2 hour booking in the week, to practice using the product. It was necessary to allow learners to practice before the post-test as it was crucial that they familiarise themselves with the isiZulu language in the interface, which is something new for them in Information Technology education.

4.7.2 DUT (IS1) post-test

The post-test was done a week later. The same participants wrote a practical test in the same test environment as in the pre-test.

The same test that was used in the pre-test session was used in the post-test (see appendix C). However, the test was based on the isiZulu OpenOffice.org.za Writer. The results of the post-test were compared to the pre-test results. Chapter 5 provides an analysis of these results.

4.8 Problems encountered and possible improvements

This section provides an analysis of the problems that could have an impact on the results. The analysis starts with the schools sample followed by the DUT (IS1) sample.

4.8.1 Schools' problems

Although the schools sample was a pilot study, valuable lessons were learnt, and this directed the main study conducted at DUT.

The initial response rate from the schools was relatively poor. Amongst the reasons for poor performance is the letter of permission issued by the Education Department, which did not place an emphasis on the importance of research projects in schools in general. As a result, many schools did not show an interest in participating in the project thereby limiting selection options. It was also found that some schools were interested more in computers being donated than just in the software that was demonstrated.

The distance also had an impact on the selection of schools, as the travelling cost involved would increase as the distance from Durban increased. Moreover, the funding for the study was not enough to travel to places in the province that were far from the city of Durban, where the researcher is based. Statistics SA (1998) reports that there are five thousand four hundred and fifteen (5415) schools in the province and this number includes universities and special schools. According to a database provided by the Department of Education (2004), a total of seven hundred and fifty seven (757) schools, including multiracial and black schools, had a

minimum of at least four computers. About three hundred (300) schools in this database were purely black schools. However, many of them were pre-primary and primary schools, and, thus, they were excluded in the sampling. The sample was therefore done from a sampling frame of approximately two hundred (200) Previously Technologically Disadvantaged high schools. However, some of these schools within the 200 were based in far-flung areas, which made them inaccessible for the purposes of this study. Therefore, the sampling method is a non-probability method and the results cannot be generalised.

Other problems that were identified include the lack of technical skills, lack of financial resources, challenges caused by hackers and computer viruses, and the lack of technological infrastructure and equipment in schools. These problems are further discussed in chapter 6.

4.9 Summary

The study used both questionnaires, computer testing methods and theory tests to collect data. There are many other methods, which could have been used in data gathering, but they were not regarded as appropriate for this study. A questionnaire measured the attitudes towards the language in Information Technology education and computer tests measured the levels of understanding, thus providing evidence of the problem. 636 questionnaires were sent out and 620 questionnaires were returned. The questions that were asked were all relevant to the study and yielded the required results. However, restrictions and problems in schools did not allow for the administration of control groups or computer tests.

CHAPTER 5

RESULTS

5.1 Introduction

The purpose of this chapter is to provide a detailed analysis of the results and findings of the study. The chapter discusses both the results from the questionnaires and the computer tests, which were completed during the field study. Tables and diagrams are used to give a clear description of the analysis. The results are first discussed for each sample, and later a comparison of both samples is made. Other useful results such as the responses captured on camera during the pilot study are also included.

5.2 Confidentiality statements and ethics

All rights to confidentiality of the participants are reserved for their interests. Moreover, the permission letter for the visits issued by the KwaZulu-Natal Department of Education clearly prohibits the use or mention of names of schools and of participants from the schools (see appendix G: permission letter). However, for the readability of the results, letters of the alphabet were used to represent school names and the word ‘learner’ followed by a number was used to represent the learner’s name, for example: School A, Learner1. This was done for both the pilot study and the DUT samples.

5.3 The questionnaires

All questionnaires were administered between 2004 and 2007. The testing for clearness of the questionnaires took place in July 2004, followed by the pilot study in schools in November 2004, the DUT (IS1) sample between April and May 2005, the SACTWU sample in November 2005 and the DUT (DS1) sample in May 2007. Six hundred and thirty six (636) questionnaires were issued and two hundred and twenty three (623) were returned.

The actual number of questionnaires used in the pilot study results and DUT (IS1) sample is 220; 177 (80%) in isiZulu and 43 (20%) in English. This number excluded the SACTWU DUT sample where 3 questionnaires were returned incomplete. The total number of questionnaires collected from the DUT (DS1) sample is 400. The overall number of questionnaires used in the results is 620.

In the first, second and third stage of data gathering, each participant was issued with two questionnaires and a pen. The participants were given the option of completing the questionnaire in the language of his/her choice. About 80% of the respondents completed the isiZulu version of the questionnaire.

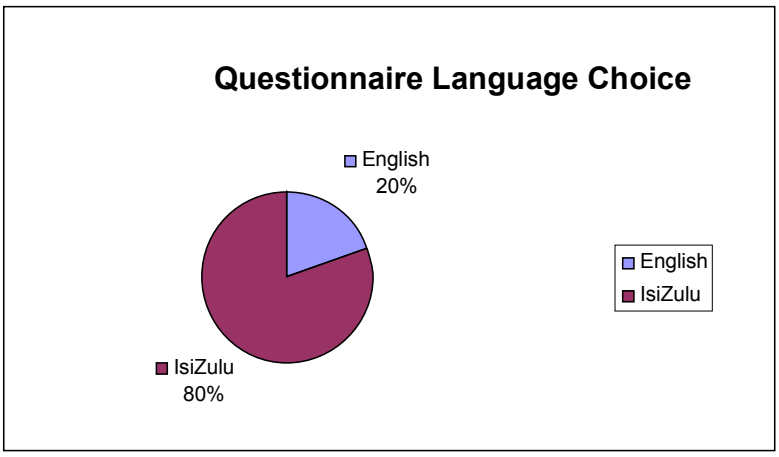


Figure 5.3: Language of Questionnaire

The same method was used in the DUT (DS1) sample. However, only one language version of the questionnaire was given, the questionnaire was English.

The order in which the results are analysed is according to each sample group, starting with the pilot study in schools, and followed by the DUT (IS1) sample. Thereafter, a joint analysis of both the schools and DUT (IS1) samples is done, which compares the respondents' attitudes towards the language in the software. The SACTWU responses (Third sample) are not included in the results. The fourth sample's, DUT (DS1), results are discussed separately and are independent of both samples, as the questionnaire that was used, was different from the one used in previous samples.

5.4 The analysis

This section is subdivided into six sub-sections. Section 5.4.1 (5.4.1.1 to 5.4.1.4) discusses the responses elicited from the questionnaires distributed to the participants in the pilot study. Section 5.4.1.5 discusses the attitudinal concerns of the respondents in the pilot study towards the use of isiZulu language in the user interface of OpenOffice.org.za Writer. Section 5.4.2 discusses questionnaire responses from the DUT (IS1) sample. The analysis is further subdivided into three sub-sections (5.4.2.1 to 5.4.2.8), the first discussing the responses from the pre-test questionnaires administered before the computer tests, next the computer test results are discussed and finally the post-test questionnaire responses are discussed. In the post-test questionnaire, only a few questions relevant to the isiZulu introduction in the user interface of OpenOffice.org.za are discussed. Section 5.4.3 combines both the pilot study

results and the post-questionnaire results from the DUT (IS1) sample. Section 5.4.4 (5.4.4.1 to 5.4.4.7) discusses learners' theory test performances when compared to DS 1 course mark.

For the purposes of readability, the results are discussed based on the similarities in the questions. For instance, questions on the English language are grouped together, irrespective of their part/section in the questionnaire.

5.4.1 Schools' analysis

5.4.1.1 English proficiency

This sub-section discusses the responses to questions 4, 10, 11 and 14(see appendix A and B), which focused on the attitudes towards English as means of communication and a medium of instruction.

Table 5.1: Schools perceptions about English language

		Participants	Percentage
English is the language of:	liberation.	133	88.67%
	International contact.	124	83%
	oppression.	9	6%
	division	8	5.33%
	tertiary education.	8	5.33%
	public affairs.	5	3.33%
	corruption.	5	3.33%
	ambition.	3	2%

English was considered as a language of international contact by 83% of the respondents, and a language of liberation by 89%. Approximately 6% of the respondents viewed English as a language of division, a language of oppression, and a language of tertiary education. Only 2% considered English as a language of ambition.

The analysis of the results on English perceptions demonstrated a clear understanding of the importance of the English language and its ability to allow communication around the world.

Table 5.2: Schools English entry level

		Participants	**Percentage**
English should be introduced as the language of learning and teaching:	from the very beginning.	106	70.67%
	during lower primary school.	20	13.33%
	Never (it should just be studied as a subject).	18	12%
	at university.	4	2.67%
	during higher primary school.	1	0.67%
	in high school.	1	0.67%

About 71% of the respondents suggested that the English language should be introduced as a language of learning and teaching from the very beginning of learning. 13% felt that it should be introduced from lower primary schools and 12% thought that English should only be studied as a subject. The analysis of the results displayed here, revealed the respondents' enthusiasm to learn English right from the beginning of their learning. However, the circumstances surrounding PTD learners do not necessarily provide them with ample opportunity to learn the English language well, considering the influences in and around their

environment. It was also noted that amongst the 71% of the respondents that preferred learning English early, were those who also recognised English as a language of international contact and a language of liberation.

Table 5.3: Schools English challenge

		Participants	Percentage
The most important problem around English language at Previously, Technologically Disadvantaged schools is:	proficiency.	92	61.33%
	Imperialism.	56	37.33%
	there is no language problem.	2	1.33%

At least 61% of the respondents indicated that the English language problem in PTD schools is caused by the fact that learners do not speak English well enough. However, 37% of the respondents believed it is because learners are forced to study through the medium of English, which is a second language for many learners. Only a very small percentage (1.33) indicated there was no problem concerning language in schools.

The analysis provided the confirmation of the lack of English skills by the majority of learners from PTD schools, which poses a threat for these learners, as their English levels are lower than that of other learners from predominantly English medium schools. One can imagine the challenges facing the PTD learners in tertiary educational settings, where the standard of teaching is usually the same for all learners irrespective of their backgrounds, and the medium of instruction is English.

Table 5.4: Schools English competency on Information Technology

My English is NOT good enough to cope with Information Technology studies.	Agree	Disagree	Don't Know
	120 80.%	17 11.33%	13 8.67%

The analysis of the first three results displayed above, indicated the importance of English in a general learning situation. However, when asked about their English language proficiency specifically related to IT studies, 80% of the respondents doubted if their English was good enough to cope with IT studies. 11% were quite happy with their English language in IT studies and 9% of the respondents were unable to give a definite answer in this regard.

The analysis displayed the unevenness in the learning of IT through the medium of English. This unevenness could have a negative impact in the IT learning environment, especially in situations where facilitators expect learners to be proficient in English.

5.4.1.2 IsiZulu proficiency and its development for academic purposes

This section discusses responses to questions 1, 2, 3, 12 and 13, which relate to the attitudes of English second language learners towards spoken and written isiZulu. It also seeks to measure how isiZulu can be developed further in order to accommodate learners' needs in education.

Table 5.5: Schools spoken and written isiZulu

Choice	Speak		Write		Read	
	Participants	**%**	**Participants**	**%**	**Participants**	**%**
Agree	140	93.33%	130	86.67%	145	96.67%
Disagree	7	4.67%	8	5.33%	5	3.33%
Don't Know	3	2.%	12	8.%	0	0%

An average of 92% of all the respondents reflected an ability to speak, read and write isiZulu thus displaying a comfortable understanding of the isiZulu language. Only 2% were unable to provide a definite answer about their ability to speak in isiZulu, and 8% were not sure about their language writing skills. The analysis confirmed high level of proficiency in both written and spoken isiZulu among the learners.

Table 5.6: Schools importance of isiZulu

		Participants	**Percentage**
IsiZulu is important:	as an official language.	148	98.67%
	Because it is the language of my people.	80	53.33%
	Because it will help me to get a job.	10	6.67%
	it is not important.	3	2%

99% of the respondents considered isiZulu to be important as an official language and 53% reflected its importance in terms of the Zulu identity. However, approximately 7% thought the isiZulu language was important to them in terms of its influence when seeking a job. Only 2% did not consider isiZulu as a language of importance.

Table 5.7: Schools possible learning in isiZulu

		Participants	Percentage
To study in isiZulu	would help me understand things better.	150	100%
	would make me feel more confident.	100	66.67%
	would help me get higher marks.	96	64%

Because of the confidence in their attitudes towards their proficiency in isiZulu, all of the respondents thought that they could understand their studies better through the medium of isiZulu. About 67% believed that their confidence in their studies could be enhanced and 64% thought that isiZulu could make a difference in boosting their performance during assessments. The analysis of the results illustrated that native language speakers preferred learning in their first language, as they believed that this would have a great influence on their learning and understanding.

5.4.1.3 IsiZulu as a language in Information Technology Education

This section discusses questions 5, 6, 7, 8, 9 and 15, which relate to the possible introduction of isiZulu to the learning of Information Technology, particularly Computer Literacy, where isiZulu OpenOffice.org.za software can be used in learning.

Table 5.8: Schools differences between spoken isiZulu and isiZulu software

	Agree	Disagree	Don't Know
IsiZulu OpenOffice.org.za software looks different to the type of isiZulu I know.	134 89.33%	9 6%	7 4.67%

89% of the respondents felt that the isiZulu language in the software is different to the isiZulu language they speak. About 6% thought it looked similar. However, 7% of the respondents could not tell the difference, as they did not know. It was expected that the isiZulu language in the software would differ slightly from the spoken isiZulu, since technical terms in any language are often not familiar to the general users of the language. In the same way, some isiZulu terms are not used in general conversation, but they exist in the isiZulu context. These terms however relate very much to the English terms that are used in the user interfaces of applications. Just as the terms "Format" on the menu bar and others such as "Default" and "Export" are not part of the general conversation of English speakers so too are their isiZulu translations: "Isakhiwo", "Okwendalo" and "Hweba Ngaphandle" respectively, not a part of everyday conversations. As language transcends all subjects, these findings could also relate to problems in other learning areas and are not confirmed to IT.

Table 5.9: Schools isiZulu OSS introduction

IsiZulu OpenOffice.org.za software should be introduced at a school level.	Agree	Disagree	Don't Know
	147 98%	0 0%	3 2%

On the question about what learners thought should be the starting point to introduce isiZulu software, 98% of the respondents agreed it was necessary that isiZulu software be introduced at a school level. 2% of the respondents did not know whether it should be introduced at school level or not.

It was assumed that this perception could have been caused by the lack of evidence on government initiatives to improve the English language learning in PTD schools. For this reason 98% of the respondents thought that the isiZulu initiative on IT learning should be started early, in order to provide learners with sufficient Computer Literacy (also see table 5.2).

Table 5.10: Choice of study

I'd rather study Information Technology in isiZulu and learn how to translate my knowledge into English, than study everything in English.	Agree	Disagree	Don't Know
	108	23	19
	72.00%	15.33%	12.67%

72% of the respondents would rather study IT in isiZulu, and then translate what they know into English. However 15% disagreed and 13% did not know. It was also noticed that the majority of the respondents that constituted the 15 % that disagreed, had previously indicated that English is the language of international contact. The results of a study by Heukelman (2005) revealed that even though isiZulu speaking people understand better when learning in isiZulu, they still preferred to be taught in English. Heukelman's study displays the evidence of the enthusiasm of the Zulu people to be proficient in the English language.

Table 5.11: Schools native isiZulu instructors

IsiZulu-speaking teachers could be of great help if they can teach software packages in isiZulu.	Agree	Disagree	Don't Know
	148 98.67%	2 1.33%	0 0%

Almost 99% of the respondents thought that they could benefit more if isiZulu-speaking teachers could teach technology in isiZulu.

Table 5.12: Possible dual-medium in IT

Using English and isiZulu languages in Information Technology education could help learners to overcome their language problems.	Agree	Disagree	Don't Know
	140 93.33%	2 1.33%	8 5.33%

Almost 93% of the respondents would like to see both languages used in Information Technology education as they felt it would help them to have a better understanding of the subject matter. However, 33% indicated a fear of possible English incompetence should they wish to continue their studies abroad. This fear appears unfounded, however, as many other people from countries such as China, Spain, France and India, where Information Technology is presented in their native languages are still able to study abroad.

Table 5.13: Schools dual-medium IT

		Participants	Percentage
If Information Technology learning becomes a dual medium (English and isiZulu) its graduates:	will have a better understanding of the topics they have studied.	140	93.33%
	will still speak English as well as they do now.	110	73.33%
	will have more problems finding jobs.	90	60%
	will have more problems continuing their studies abroad.	50	33.33%

The results on possible dual-medium instruction, demonstrated the respondents' willingness to study computers in both languages for better understanding of Information Technology education. Almost 93% of the respondents hoped they would have a better understanding of the subject matter through dual-medium technology studies.

5.4.1.4 Refection on software translation projects

This section discusses questions 16 and 17, which could have an impact on software localising companies and researchers.

Translation projects

Table 5.14: Schools isiZulu recommendation

Would you recommend the use of isiZulu OpenOffice.org.za to anyone else?	**Yes**	**No**	**Don't Know**
	150 100%	0 0%	0 0%

Table 5.15: Schools Translate.org.za recommendation

Do you feel that Tholulwazi and Translate.org.za should carry on with software translation into isiZulu?	**Yes**	**No**	**Don't Know**
	140 90%	10 10%	0 0%

In table 5.14 and 5.15, at least 90% of the respondents agreed that software translations into isiZulu should be carried out. All the respondents were happy to promote isiZulu software to others.

5.4.1.5 Attitudes towards the isiZulu language software

In chapter 4, it was mentioned that other attitudinal responses on the use of isiZulu in the software were captured on camera. This was done in the pilot study with schools to verify responses in the questionnaires and to gain more insight into the research areas that could have been ignored. Forty-six (46) responses were captured randomly in an open and unlimited environment. Thus, not all 150 learners who completed the questionnaires provided verbal responses as well. Moreover, these responses do not form part of the questionnaire, but serve

to add more insights to the questionnaire. All responses were received in isiZulu and later translated into English for the formality of the thesis.

The participating schools and learners are referred to as schools A-I, and learners' 1-n in each school (see appendix D). Responses were not limited to a specific number of learners per school, but rather to an estimated time. The question asked required learners to express their attitudes towards the isiZulu OpenOffice.org.za software, which had been demonstrated. Of the 46 responses, only three responses were negative, meaning that learners did not like the idea of isiZulu in the software. Each positive response was rated as +1, and a negative response -1. This constitutes 93% of the positive responses and 7% of negative responses. These responses are shown in appendix D.

5.4.2 DUT (IS1) pre-questionnaire results

The pre-questionnaire was carried out in April 2005. The results obtained from this sample were much more focused than the ones in the pilot study. There was much greater consistency in the responses. In this section, responses are also subcategorised according to the similarities in the questions.

5.4.2.1 English proficiency

This sub-section discusses the responses to questions 4,10,11 and 14 (see appendix A), which focused on the attitudes towards English as means of communication and a medium of instruction.

Table 5.16: DUT perceptions around the English language

English is the language of:	Participants	Percentage
international contact.	30	85.71%
liberation.	29	82.86%
tertiary education.	22	62.86%
division.	0	0%
public affairs.	0	0%
ambition.	0	0%
corruption.	0	0%
oppression.	0	0%

Approximately 86% of the respondents viewed English as a language of international contact, whilst 83% regarded it as a language of liberation, and almost 63% viewed it as a language of tertiary education.

Table 5.17: DUT English entry level

English should be introduced as the language of learning and teaching:		Participants	Percentage
	from the very beginning.	28	80%
	in secondary school.	0	0%
	during lower primary school.	7	20%
	at university.	0	0%
	never (it should just be studied as a subject).	0	0%

80% of the respondents preferred English to be introduced right from the beginning of schooling. A further 20% was not so far away from the early introduction of English as they felt it should be started in lower primary schools.

Table 5.18: DUT English challenge

The most important problem around English language in Previously, Technologically Disadvantaged schools is:		**Participants**	**Percentage**
	proficiency.	34	97.14%
	imperialism.	1	2.86%
	there is no language problem.	0	0.00%

97% of the respondents acknowledged the fact that one of the causes of problems in English learning is that most learners do not speak English well enough. Only 3% felt that the problem occurs because they are forced to learn through the medium of English. The results of this analysis proved the assumption that the English language is a challenge to the learners from PTD schools.

Table 5.19: English competency

My English is NOT good enough to cope with Information Technology studies.	Agree	Disagree	Don't Know
	24	4	7
	68.57%	11.43%	20%

When asked about their competency in English language and its use in teaching IT studies, approximately 69% of the respondents still felt that their English was not good enough to cope with Information Technology studies. 20% of the respondents could not rate themselves on their English competency in IT learning and about 11% were comfortable with learning Information Technology in English. However, the DUT (IS1) pre-test has shown that 76% of learners could understand English language in the test.

5.4.2.2 IsiZulu proficiency and its development for academic purposes

This section discusses responses to questions 1, 2, 3, 12 and 13, which relate to the attitudes of English second language learners towards spoken and written isiZulu. In addition, it measures how isiZulu can be developed further to accommodate learners in education.

Table 5.20: DUT spoken and written IsiZulu

	Speak		Write		Read	
Choice	**Participants**	**%**	**Participants**	**%**	**Participants**	**%**
Agree	35	100%	35	100%	27	77.14%
Disagree	0	0%	0	0%	5	14.29%
Don't Know	0	0%	0	0%	3	8.57%

Even though all respondents acknowledged that they could speak and write isiZulu well, only 77% of all the respondents could read isiZulu, which could influence the viability of an isiZulu interface. 14% could not read and 9% of the respondents were not sure whether they could read well in isiZulu or not.

Table 5.21: DUT importance of isiZulu

IsiZulu is		**Participants**	**Percentage**
important:	As an official language.	35	100%
	because it will help me to get a job.	1	2.86%
	because it is the language of my people.	8	22.86%
	It is not important.	0	0%

About 74% of the respondents acknowledged the importance of isiZulu as an official language, 23% saw it as the language of the Zulus and the 3% felt its importance in securing jobs.

Table 5.22: DUT Studying in isiZulu

To study in isiZulu:		Participants	Percentage
	would make me feel more confident.	35	100%
	would help me understand things better.	34	97.14%
	would help me get higher marks.	34	97.14%

Overall, the respondents were confident that learning in isiZulu was a solution to help them understand concepts better. About 97% expected that it would increase their pass rate.

5.4.2.3 IsiZulu as a language in Information Technology education

This section discusses questions 5, 6, 7, 8, 9, and 15, which relate to the possible introduction of isiZulu as a medium of instruction in Information Technology, particularly Computer Literacy, where isiZulu OpenOffice.org.za software can be used.

Table 5.23: DUT differences between spoken isiZulu and isiZulu software

IsiZulu OpenOffice.org.za software looks different to the type of isiZulu I know.	Agree	Disagree	Don't Know
	15 42.85%	20 57.14%	0 0%

About 43% of the respondents felt that the isiZulu language in the software looked different from their spoken isiZulu. According to Bailey (2004), there are differences between spoken language and written language. This could be the reason why 43% of the respondents find the language of the software different. Moreover, this may be caused by an introduction of new terms as a result of translations, some of which are borrowed from the English language. However, 57% thought it was familiar.

Table 5.24: DUT software introduction level

IsiZulu OpenOffice.org.za software should be introduced at a school level.	Agree	Disagree	Don't Know
	35 100%	0 0%	0 0%

All respondents admitted that it would be better if the isiZulu software could be introduced at a school level.

Table 5.25: DUT choice of study

I'd rather study Information Technology in isiZulu and learn how to translate my knowledge into English, than to study everything in English.	Agree	Disagree	Don't Know
	30 85.71%	5 14.29%	0 0%

86% of the respondents thought it would be better if they were to learn in isiZulu and then later translate their knowledge into English. About 14% of the respondents were not in favor of the statement.

Table 5.26: DUT teacher involvement

IsiZulu-speaking teachers could be of great help if they can teach software packages in isiZulu	Agree	Disagree	Don't Know
	31 88.57%	4 11.43%	0 0%

When asked about what they thought regarding isiZulu speaking teachers being able to teach software packages in isiZulu, 89% felt it would be of great help and 11% did not think so.

The analysis of the following two tables is combined:

Table 5.27: DUT dual-medium solution to IT

Using English and isiZulu languages in Information Technology education could help learners to overcome their language problems.	Agree	Disagree	Don't Know
	32 91.43%	2 5.71%	1 2.86%

The analysis in tables 5.27 and 5.28 show that the majority of the respondents would like to see both languages used in the software, as it could help them understand better. 6% were not in favour of both languages being used, and 66% feared that being exposed to dual-medium software in their IT studies would make it problematic to study abroad. 34% of the respondents were concerned about problems in finding jobs.

It was also noticed that throughout the questionnaire, where an isiZulu suggestion is made, respondents did not quite agree, but where both languages are given as an option, a greater percentage of the respondents agreed. The analysis reflected an interest in learning in both languages.

Table 5.28: DUT dual-medium solution to success

		Participants	**Percentage**
If Information Technology learning becomes a dual medium (English and isiZulu) its graduates:	will have a better understanding of the topics they have studied.	34	97.14%
	will still speak English as well as they do now.	0	0%
	will have more problems finding a job.	12	34.29%
	will have more problems continuing their studies abroad.	22	65.71%

5.4.2.4 Reflection on software translation projects

The following responses to questions 16 and 17 are crucial for the benefit of organisations such as Translate.org.za, OpenOffice.org.za and other academic researchers who may want to conduct studies in software and languages.

Table 5.29: DUT isiZulu recommendation

Would you recommend the use of isiZulu OpenOffice.org.za to anyone else?	**Yes**	**No**	**Don't Know**
	35 100%	0 0%	0 0%

Table 5.30: DUT Translate.org.za recommendation

Do you feel that Tholulwazi and Translate.org.za should carry on with software translation into isiZulu?	**Yes**	**No**	**Don't Know**
	35 100	0 0%	0 0%

Tables 5.29 and 5.30 show an overwhelming 100% response, recognising the value of the translation project.

5.4.2.5 DUT (IS1) pre-test

A pre-test session was done on the DUT (IS1) sample in May 2005. There were known facts about the second language learners' Computer Literacy levels prior to the pre-testing. Learners had already been exposed to a word processor. The test used in the pre-test was obtained from

the Department of Information Technology at DUT. The test was based on the English version of OpenOffice.org.za Writer, a word processor (see appendix C).

The test results were rated according to the test specification and the mark allocation in the test. The codes used in the mark allocation table are as follows: PI = Paragraph, S= Line Spacing, B=Bold, U=Underline, I=Italics, C=Colour, H=Header, F= Footer and PB= Page border. A simple test was selected, as it was taken into consideration that some options that are familiar to learners in Microsoft Word may not necessary be easy to find in OpenOffice.org.za Writer. A full mark is shown next to each code. A detailed analysis of the pre-test is reflected in appendix H: Computer test results.

5.4.2.6 DUT (IS1) post-test

A post-test was done in May 31, 2005. The same participants wrote a practical test in the same test environment as in the pre-test. The same test used in the pre-test was used in the post-test. However, this test was done on the isiZulu OpenOffice.org.za software as opposed to English software in the pre-test (see appendix C). The same method was used to analyse the results, each question was marked according to its specification and mark allocation. A detailed analysis of the post-test is shown in appendix H: Computer test results.

5.4.2.7 Pre and post-test analysis

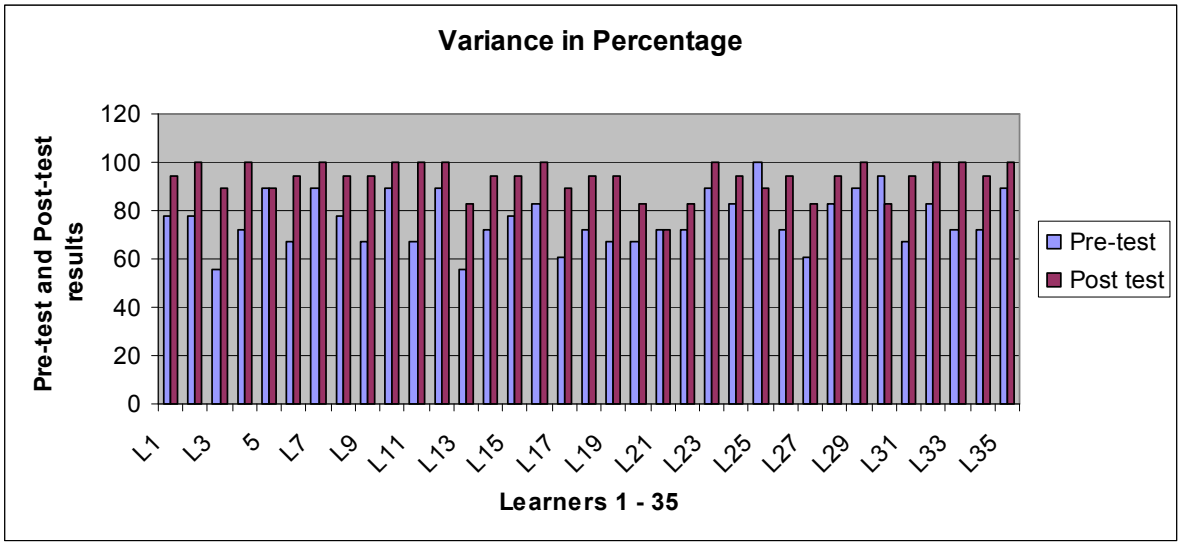


Figure 5.4.2.7a: Variance in percentages

The results displayed a major improvement of marks. Although the pre-test average per learner exceeded a 50% pass rate, which is a normal pass rate of an average learner, further improvements were reflected in the post-test. However, L25 and L30 dropped in their marks slightly in the post-test. From a 100% L25 dropped to 89% and L30 dropped from 94% to 83%. The rest of the marks were higher than the results obtained in the pre-test.

Variance in average

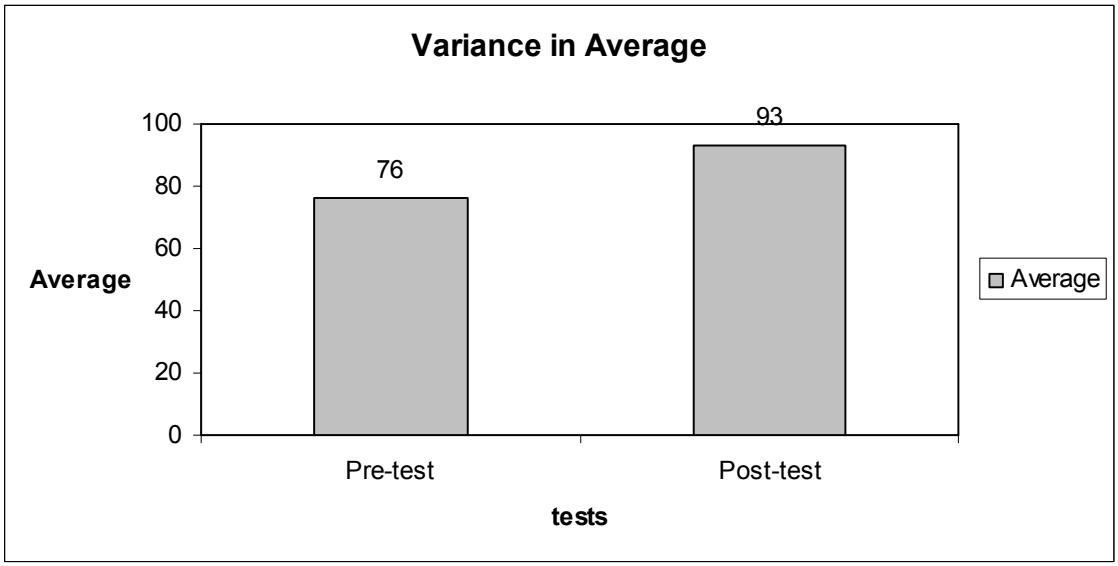


Figure 5.4.2.7b: Variance in averages

An overall percentage of the pre-test average was 78% and of the post-test average was 93%. The 93% average demonstrated an understanding of the isiZulu interface of OpenOffice.org.za (Writer) by these learners, which proves the hypothesis of the study, that 'using isiZulu in the user interface of a program could contribute to a greater understanding of Computer Literacy as a subject and elevate the level of Computer Literacy of English second language learners.

5.4.2.8 Post-questionnaire analysis

A post-test questionnaire was done in May 2005, after the post-test session. This section discusses a few selected responses that were obtained from the DUT (IS1) sample after these tests were given. The same questionnaire was used and it consisted of the questions associated with isiZulu as a language in Information Technology education (7, 8, 13, 15, 16 and 17). This

measurement was especially conducted to evaluate the changes in the attitudes of the respondents after they had been exposed to the actual environment and were tested on both interfaces.

Table 5.31: DUT Post choice of study

I'd rather study Information Technology in isiZulu and learn how to translate my knowledge into English, than to study everything in English.	Agree	Disagree	Don't Know
	34 97.14%	1 2.86%	0 0%

Almost all the respondents preferred to first learn computers in isiZulu, then transfer their knowledge to English. The analysis of these results indicated an increase of 11% in the responses when compared in the pre-test questionnaire from 85.71% to 97.14%

Table 5.32: DUT Post studying in isiZulu

To study in isiZulu:		**Participants**	**Percentage**
	would make me feel more confident.	35	100%
	would help me understand things better.	35	100%
	would help me get higher marks.	33	94.28%

All respondents still believed that isiZulu could help them understand things better as they are more confident when learning in their own language. There was a slight decrease in the isiZulu perception of getting a higher mark, from 97.14% to 94.28%.

Table 5.33: DUT post language challenge

Using English and isiZulu languages in Information Technology education could help learners to overcome their language problems.	Agree	Disagree	Don't Know
	34 97.1%	1 2.7%	0 0%

97% of the respondents preferred the use of isiZulu in IT as they felt that it would help them overcome the language problem, as opposed to the 91% response obtained in the pre-test questionnaire.

Table 5.34: DUT Post possible dual-medium instruction

If Information Technology learning becomes a dual medium (English and isiZulu) its graduates:		**Participants**	**Percentage**
	will have a better understanding of the topics they have studied.	34	97.1%
	will still speak English as well as they do now.	0	0%
	will have more problems finding a job.	4	11.4%
	will have more problems continuing their studies abroad.	15	43%

About 97% of the respondents were confident that they could understand better in both languages. However, there was a slight decrease of 23% (34.29% - 11.43%) on the job perceptions, and a change of 20% about studies abroad, with fewer students feeling that they would have problems studying abroad if dual-medium instruction is carried out in IT studies.

Table 5.35 : DUT Post isiZulu recommendation

Would you recommend the use of isiZulu OpenOffice.org.za to anyone else?	Yes	No	Don't Know
	35 100%	0 0%	0 0%

Table 5.36 : DUT Post Translate.org.za recommendation

Do you feel that Tholulwazi and Translate.org.za should carry on with software translation into isiZulu?	Yes	No	Don't Know
	35 100	0 0%	0 0%

Responses on the recommendations remained at an overwhelming 100%.

5.4.3 Pilot study and DUT (IS1) results combined

This section discusses the similarities and differences in the responses between the pilot study and the DUT (IS1) study. All questions discussed are selected from the post-test questionnaire used on the DUT (IS1) sample. Therefore the results will reflect the post-test questionnaire responses from the DUT (IS1) sample (7, 8,13,15,16 and 17) compared to the responses from the pilot study conducted at the schools. Only matching responses are discussed, as they result in a much more focused output of the study.

IsiZulu then Translate to English

97% of the respondents from the DUT (IS1) sample preferred to transfer knowledge from isiZulu to English as opposed to the 72% from the schools' pilot study sample.

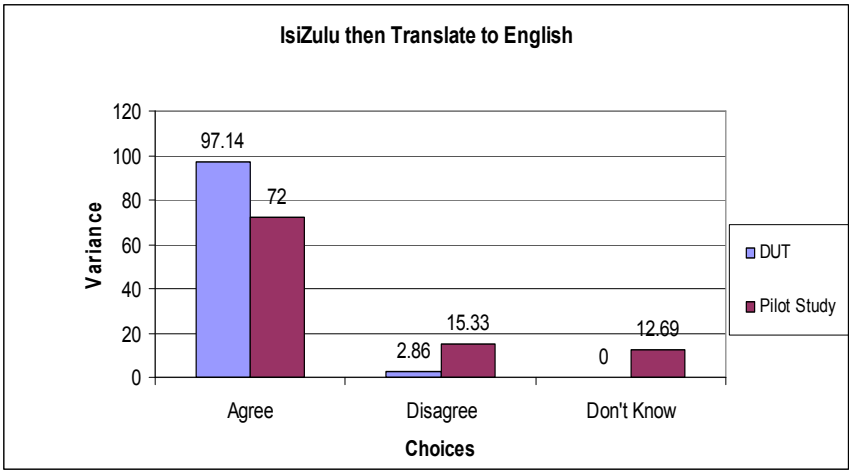


Figure 5.4.3a: Language of choice

Almost all DUT (IS1) respondents believed that isiZulu could boost their confidence and understanding of concepts, as compared to 67% of the respondents from a pilot study who felt the same. However, only 64% of the respondents in the pilot study felt that the use of isiZulu as a medium of instruction could boost their marks as opposed to 94% of the respondents from the DUT (IS1) sample. All the respondents in the pilot study indicated that they could understand IT better when taught through the medium of isiZulu.

Overcoming the language problem

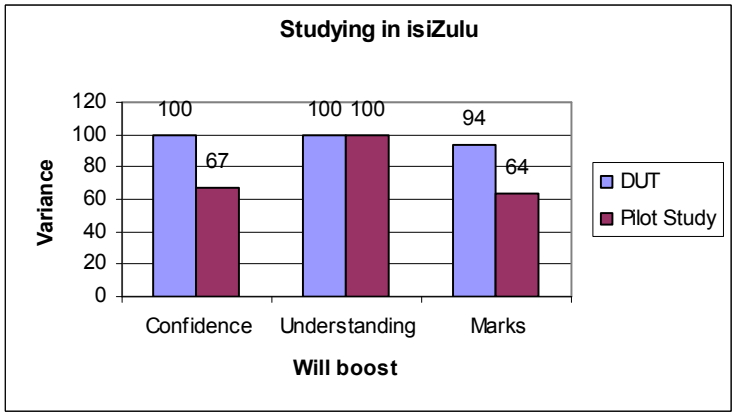


Figure 5.4.3b: Studying in isiZulu

Almost all respondents (97% of the DUT (IS1) sample and 93% of the schools' pilot study sample) believed that the language problem could be overcome by introducing isiZulu to the IT learning situation.

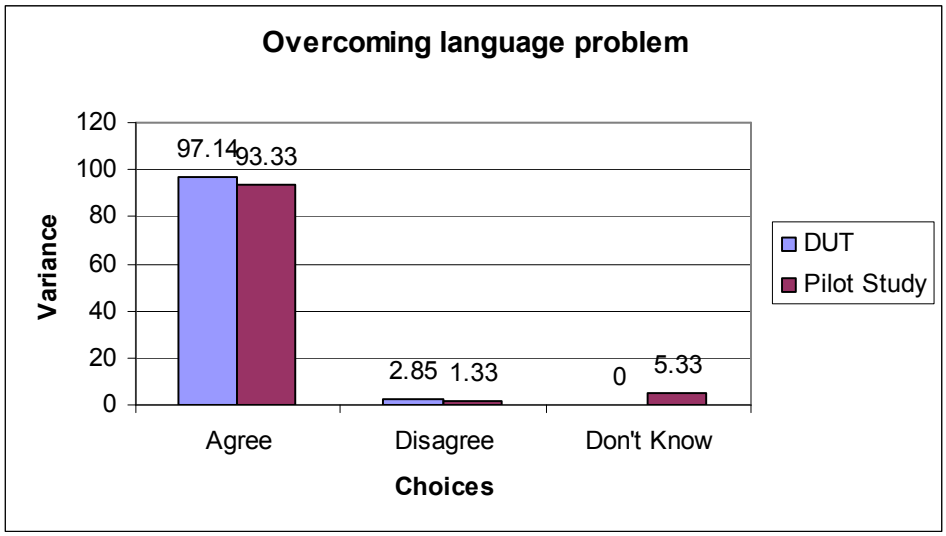


Figure 5.4.3c: The language challenge

Graduates Challenge

Almost all respondents agreed that there would be a greater understanding of concepts when taught through the medium of isiZulu. However, almost 40% from both samples (33% in the pilot study) highlighted that the communication factor could present a challenge in the event that they had an opportunity to study oversees.

Almost 60% of the respondents in the pilot study also expressed their concerns as far as jobs are concerned, as they thought that being exposed to the isiZulu language in the software during studies would lessen their chances of employment.

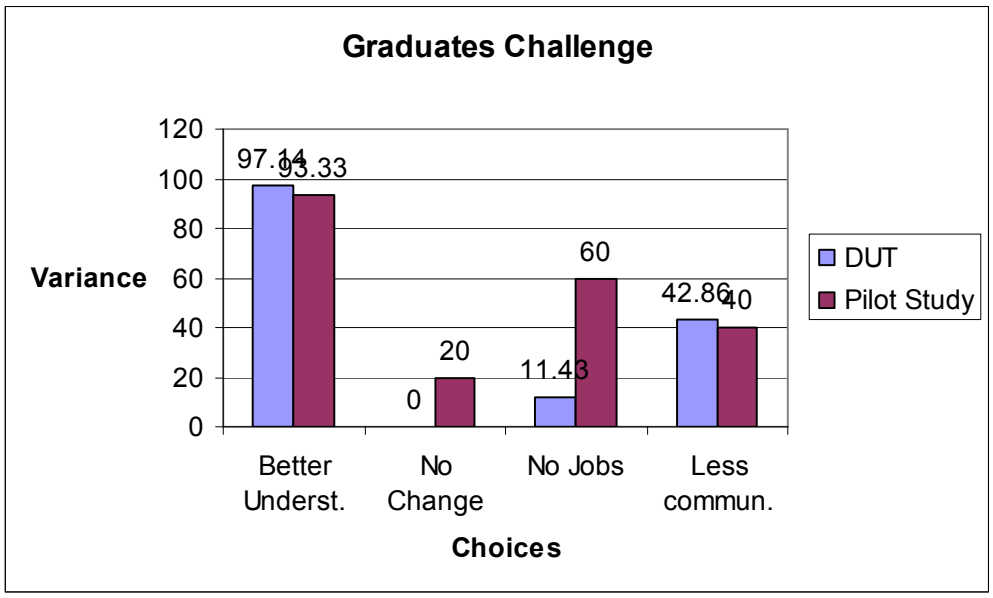


Figure 5.4.3d: The Graduates Challenge

5.4.4 DUT (DS1) sample results

In this section, the results from each group selected in the DUT (DS1) sample are discussed first. Thereafter, a joint analysis of all groups is discussed. Figures are used to explain the results. Each group analysis is first discussed based on figures obtained from the analysis produced in Ms Excel, thereafter it is discussed based on the best association rules found by the WEKA data miner.

5.4.4.1 Group C Analysis

Group C consisted of 46 participants. Both the sections on procedures and functions were taught to this group in isiZulu only. Figure 5.4.5a shows an analysis of the results obtained from the test (Test) conducted after the study and the DS 1 semester 1 course mark (DS).

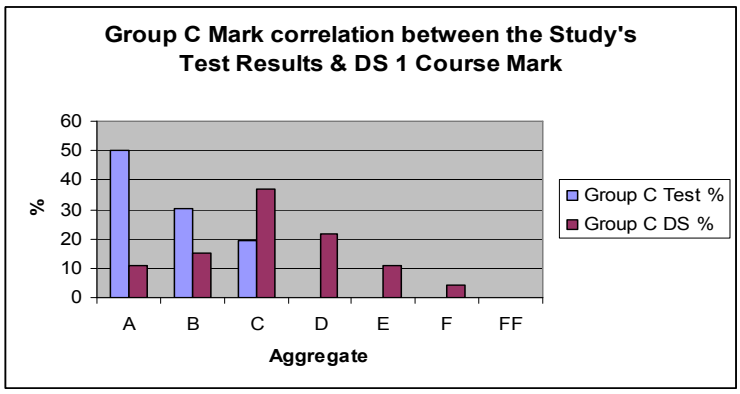


Figure 5.4.5a: Group C Correlation

50% of the learners obtained a test aggregate of A as compared to 11% who obtained the same mark in DS. 30% of the test sample as compared to 15% in the DS section received an

aggregate of B. A C aggregate was obtained by 20% of the learners in the test sample, whereas 37% of the learners obtained a similar result in the DS course mark. The DS course mark also included 22% of learners performing at a D aggregate, 11% at an E aggregate and 4% at an F aggregate.

The progress, comparing the study's test results and DS 1 course mark is shown in figure 5.4.5.b below.

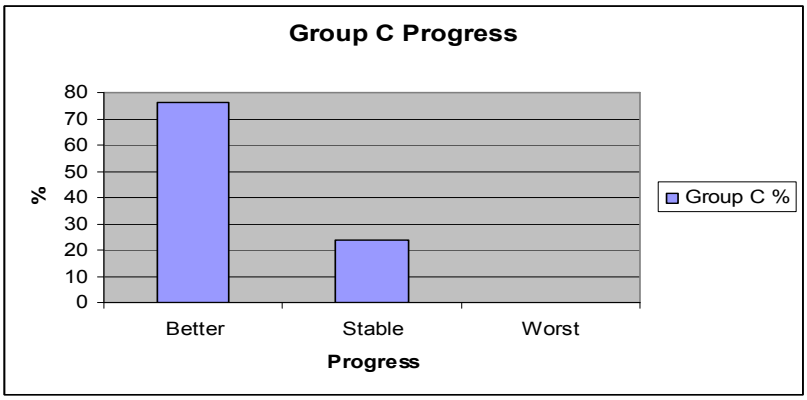


Figure 5.4.5b: Group C Progress

When comparing the study's test results to the DS 1 course mark, 76% of the learners performed better in the test and 24% remained unchanged (stable).

The best association rules found by WEKA for Group C are listed and interpreted below. Each of these rules is based on a 100% confidence factor.

Best Rules:

1. Test Results=A DS Course Mark=C 10 ==> Progress=better 10

2. Test Results=A DS Course Mark=B 5 ==> Progress=better 5
3. DS Course Mark=D 10 ==> Progress=better 10
4. DS Course Mark=E 5 ==> Progress=better 5

Rules Interpretation:

1. Ten learners showed improvement to an aggregate of A in the test from a C aggregate for DS.
2. Five learners showed improvement to an aggregate of A in the test from a B aggregate for DS.
3. Ten learners with a D aggregate in DS performed better in the test.
4. Five learners with a DS course mark of E performed better in the test.

5.4.4.2 Group D Analysis

Group D consisted of 46 participants. This group was taught in both isiZulu and English (Mixed) for both sections on procedures and functions. Figure 5.4.5c shows an analysis of the results obtained from the test (Test) conducted after the study and the DS 1 semester 1 course mark (DS).

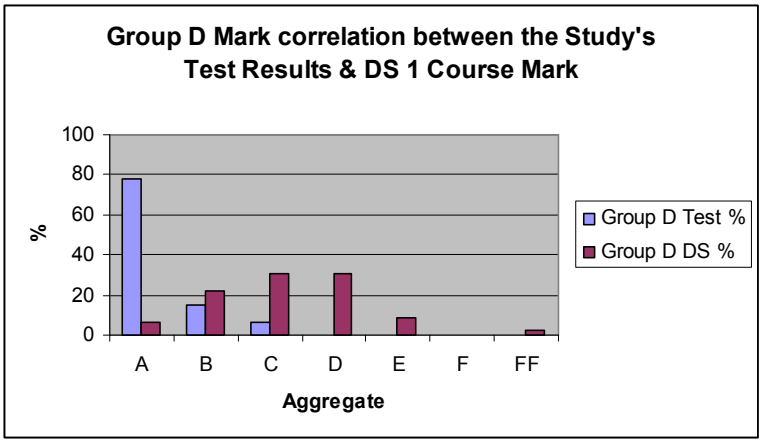


Figure 5.4.5c: Group D Correlation

78% of Group D learners obtained a test aggregate of A as compared to 7% who obtained the same mark in DS. 15% of the test sample as compared to 22% in the DS section received an aggregate of B. A C aggregate was obtained by 7% of the learners in the test sample whereas 30% of learners obtained a similar result in the DS course mark. The DS course mark also included 30 % of learners performing at a D aggregate, 9% at an E aggregate and a 2% at the lowest FF aggregate. The progress, comparing the study's test results and DS 1 course mark is shown in figure 5.4.5.d below.

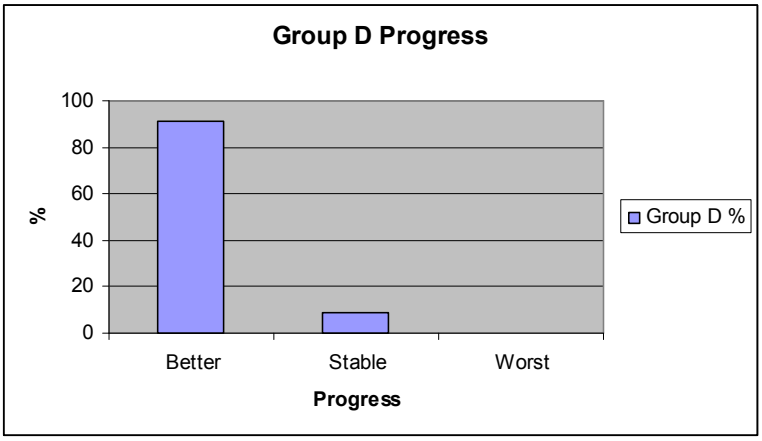


Figure 5.4.5d: Group D Progress

When comparing the study's test results to the DS 1 course mark, 91% of the learners performed better in the test and 9% remained unchanged (stable).

The best association rules found by WEKA for Group D are listed and interpreted below. Rules 1, 2 & 3 are based on a 100% confidence factor, rule 5 on 93% confidence factor and rule 6 on 92% confidence factor.

Best Rules:

1. DS Course Mark=D 14 ==> Progress=better 14
2. Test Result=A DS Course Mark=C 12 ==> Progress=better 12
3. Test Result=A DS Course Mark=B 10 ==> Progress=better 10
5. DS Course Result=C 14 ==> Progress=better 13
6. Test Result=A 36 ==> Progress=better 33

Rules Interpretation:

1. Fourteen learners with a D, DS aggregate performed better.
2. Twelve learners showed improvement to an aggregate of A in the test from a C aggregate for DS.
3. Ten learners showed improvement to an aggregate of A in the test from a B aggregate for DS.
4. Fourteen learners with a C, DS aggregate performed better.
5. Thirty six of thirty three learners with a test aggregate of A performed better.

5.4.4.3 Group E Analysis

Group E consisted of 44 participants. This group was taught both in English and isiZulu, with the section on procedures being taught in English and functions in isiZulu. Figure 5.4.5e shows an analysis of the results obtained from the test (Test) conducted after the study and the DS 1 semester 1 course mark (DS).

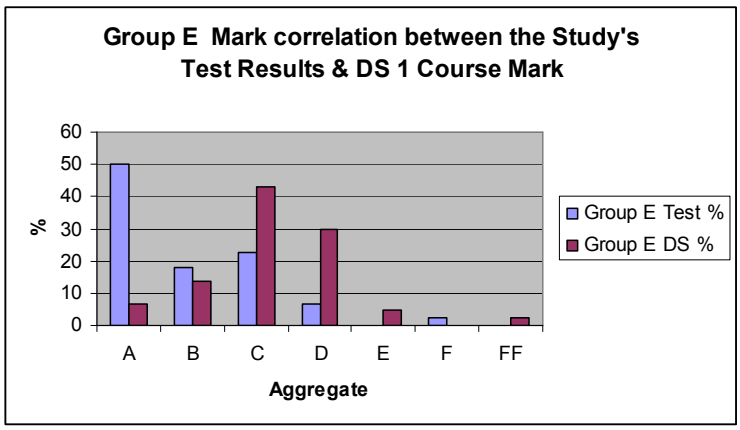


Figure 5.4.5e: Group E Correlation

50% of the learners obtained a test aggregate of A as compared to 7% who obtained the same mark in DS. 18% of the test sample as compared to 14% in the DS section received an aggregate of B. 23% of the test sample as compared to 43% in the DS section received an aggregate of C. A D aggregate was obtained by 7% of the learners in the test sample, whereas 30% of the learners obtained a similar result in DS. The DS course mark also included 5 % of learners performing at an E aggregate and 2% a lowest FF aggregate. 2% of the learners obtained a test aggregate of F. The progress, comparing the study's test results and DS 1 course mark is shown in figure 5.4.5.f below.

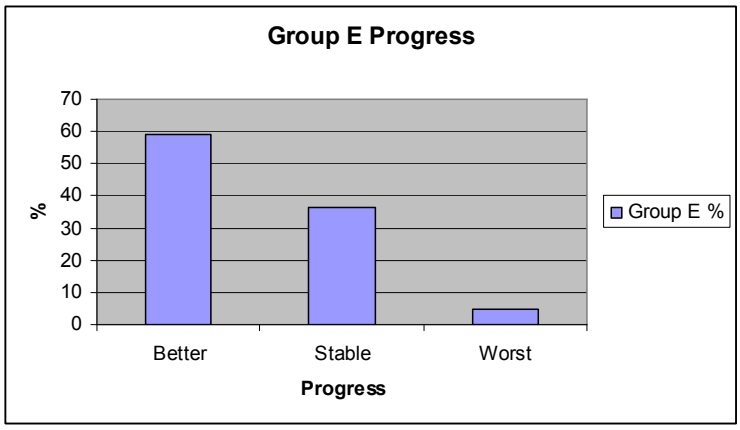


Figure 5.4.5f: Group E Progress

When comparing the study's test results to the DS 1 course mark, 59% of the learners performed better in the test, 36% remained unchanged (stable) and 5% of the learners received a mark that was worse than their DS1 course mark.

The best association rules found by WEKA for Group E are listed and interpreted below. Rules 1, 2, 3 are based on a 100% confidence factor and rule 4 at 91% confidence factor.

Best Rules:

1. Test Results=A DS Course Mark=C 9 ==> Progress=better 9
2. Test Results=C DS Course Mark=C 8 ==> Progress=stable 8
3. Test Results=A DS Course Mark=D 5 ==> Progress=better 5
4. Test Results=A 22 ==> Progress=better 20

Rule Interpretation:

1. Nine learners showed improvement to an aggregate of A in the test from a C aggregate for DS.
2. Eight learners with a test aggregate of C as well as DS remained unchanged (stable).
3. Five learners showed improvement to an aggregate of A in the test from a D aggregate for DS.
4. Twenty of twenty two learners with a test aggregate of A, performed better.

5.4.4.4 Group PTB Analysis

Group PTB consisted of 36 participants. This group was taught both in isiZulu then in English, with the section on procedures being taught in isiZulu and functions in English. Figure 5.4.5g shows an analysis of the results obtained from the test (Test) conducted after the study and the DS 1 semester 1 course mark (DS).

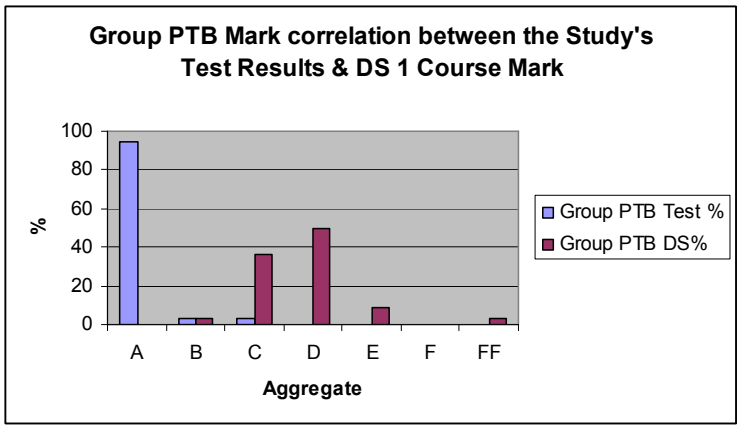


Figure 5.4.5g: Group PTB Correlation

94% of the learners obtained a test aggregate of A as compared to 0% in DS. 3% however, received a B aggregate in both the test sample and a DS course mark. The DS course mark also included 36% of learners performing at a C aggregate, 50% at a D aggregate, 8% at an E aggregate and 3% at a lower FF aggregate. The progress, comparing the study's test results and DS 1 course mark is shown in figure 5.4.5.h below.

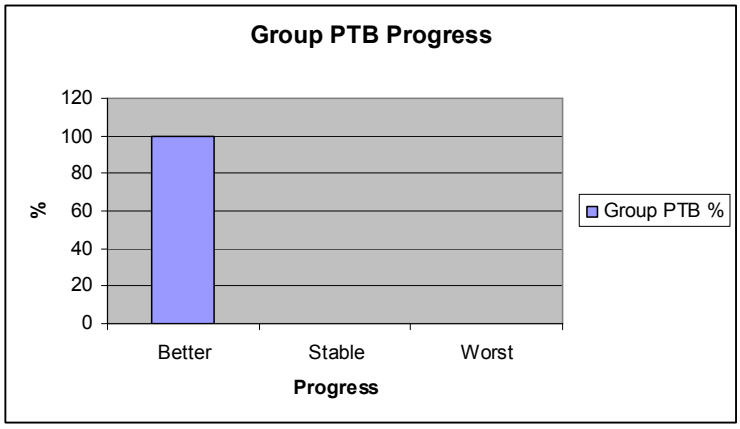


Figure 5.4.5h: Group PTB Progress

When comparing the study's test results to the DS 1 course mark, all 36 learners (100%) performed better in the test.

The best association rule found by WEKA for Group PTB are listed and interpreted below. This rule is based on a 94% confidence factor.

Best Rule:

1. Progress=better 36 ==> Test Result=A 34 conf:(0.94)

Rule Interpretation:

1. Thirty six learners amongst the thirty four, with an A aggregate performed better.

   - One of the remaining two learners obtained a test aggregate of B and the other of C.

5.4.4.5 Group PTA Analysis

Group PTA consisted of 28 participants. This group was taught in English only for both sections on procedures and functions. Figure 5.4.5i shows an analysis of the results obtained from the test conducted after the study and the DS 1 semester 1 course mark (DS).

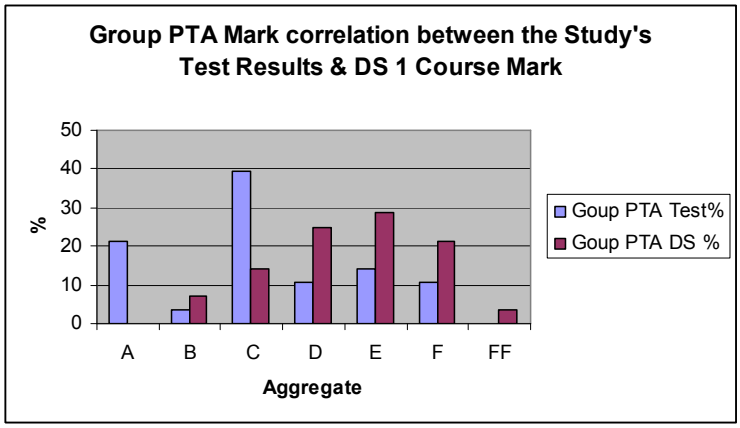


Figure 5.4.5i: Group PTA Correlation

21% of the learners obtained a test aggregate of A as compared to 0% in DS. 4% of the learners obtained a test aggregate of B as compared to 7% who obtained the same mark in DS. 39% of the learners obtained a test aggregate of C as compared to 14% who obtained the same

mark in DS. 11% of the learners obtained a test aggregate of D as compared to 25% who obtained the same mark in DS. 14% of the learners obtained a test aggregate of E as compared to 29% who obtained the same mark in DS. 11% of the learners obtained a test aggregate of F as compared 21% who obtained the same mark in DS. The DS course mark also included 4% of learners performing at an FF aggregate. The progress, comparing the study's test results and DS 1 course mark is shown in figure 5.4.5.j below.

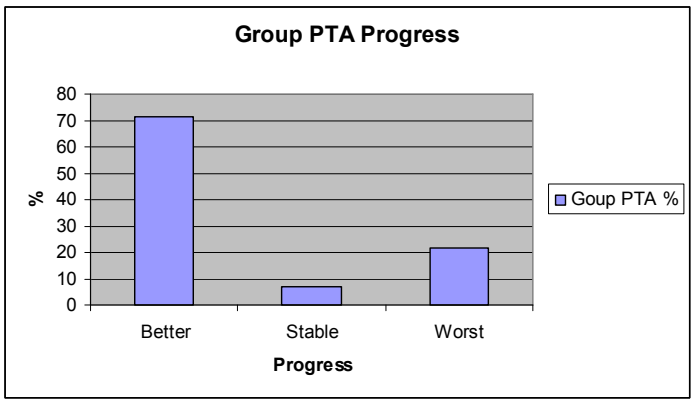


Figure 5.4.5j: Group PTA Progress

When comparing the study's test results to the DS 1 course mark, 71% of the learners performed better in the test, 7% remained unchanged (stable) and 21% were worse.

The best association rules found by WEKA for Group PTA are listed and interpreted below. Each of these rules is based on a 100% confidence factor.

Best Rules:

1. DS Course Mark=F 6 ==> Progress=better 6
2. Test Mark=E Progress=worst 3 ==> DS Course Mark=D 3
3. Test Mark=C DS Course Mark=F 3 ==> Progress=better 3
4. Test Mark=C DS Course Mark=E 3 ==> Progress=better 3
5. Test Mark=D 3 ==> Progress=better 3
6. Test Mark=F 3 ==> Progress=worst 3

Rules Interpretation:

1. Six learners with a DS aggregate of F achieved better in the test
2. Three learners with a D aggregate in DS did not achieve in the test
3. Three learners showed improvement to an aggregate of C in the test from an F aggregate for DS.
4. Three learners showed improvement to an aggregate of C in the test from an E aggregate for DS.
5. Three learners with a test aggregate of D performed better.
6. Three learners with a test aggregate of F did not achieve in the test

5.4.4.6 Overall Analysis

The total number of learners that participated in the DS1 sample was two hundred (200). The aggregates of all groups are shown in figure 5.4.5k below:

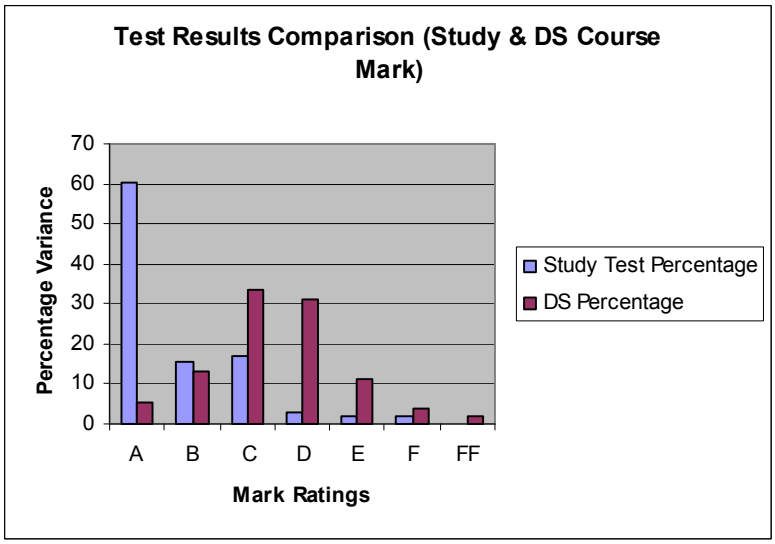


Figure 5.4.5k: Overall Correlation

61% of the learners obtained a test aggregate of A as compared to 6% who obtained the same mark in DS. 16% of the learners obtained a test aggregate of B as compared to 13% who obtained the same mark in DS. 17% of the test sample as compared to 34% in the DS section received an aggregate of C. 3% of the learners received a test aggregate of D as compared to 31% who received the same mark in DS. 2% of the learners obtained a test aggregate of E as compared to 4% who received the same mark in DS. 2% of the learners obtained a test aggregate of F as compared to 4% who obtained the same mark in DS. DS also included an additional 2% FF aggregate.

Figure 5.4.5l below, shows the overall progress

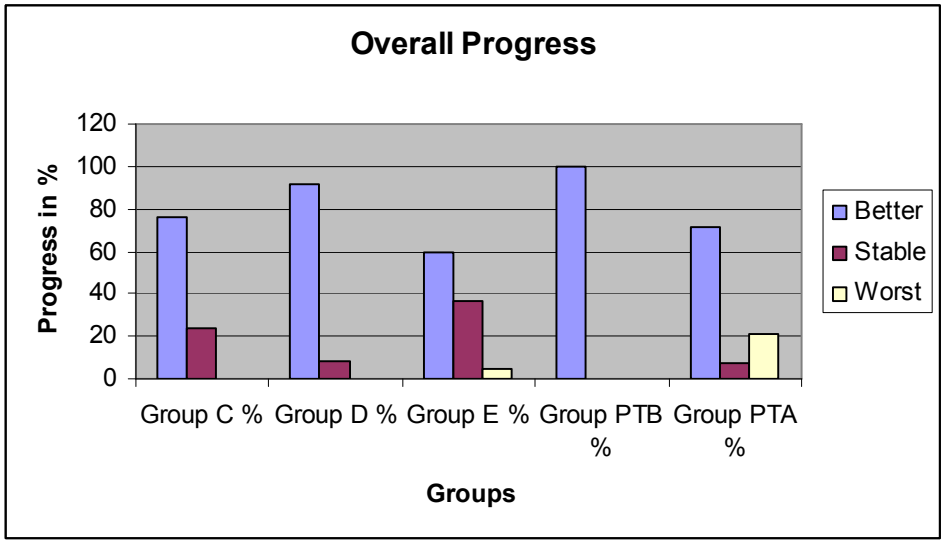


Figure 5.4.5l: Overall Progress

76% of learners from group C performed better, 24 % remained unchanged (stable) and none deteriorated. 91% of group D learners performed better, 9% remained unchanged and none performed worse than their DS results. 59% of learners in Group E performed better, 36 remained unchanged and 5% of the learners' performance was worse. All learners (100%) in group PTB performed well. 71% of the learners in group PTA performed better, 7% were stable and 21% worsened.

The best association rules found by WEKA for all groups combined are listed and interpreted below. Rules 1,2,3,4 are based on a 100% confidence factor and 5, 6 based on a 98% confidence factor.

Best rules:

1. Test_Results=A DS Course Mark=C 45 ==> Progress=better 45
2. Group =PartTime_B 36 ==> Progress=better 36
3. Test_Results=A DS Course Mark=D 34 ==> Progress=better 34
4. Group =PartTime_B Test_Results=A 34 ==> Progress=better 34
5. Pre_Preferred Language=Mix Test_Results=A 55 ==> Progress=better 54
6. Pre_Preferred Language=Mix Test_Results=A Post_Preferred Language=Mix 40 ==> Progress=better 39

Rules Interpretation:

1. Forty Five learners showed improvement to an aggregate of A in the test from a C aggregate for DS.
2. All thirty-six learners from group PTB performed better.
3. Thirty- four learners showed improvement to an aggregate of A in the test from a D aggregate for DS.
4. Thirty four learners from PTB with a test aggregate of A performed better.
5. Fifty Five learners that preferred both English and isiZulu in the pre test questionnaire, obtained a test aggregate of A and performed better.
6. Thirty nine of the forty learners that preferred both English and isiZulu in the pre-test questionnaire as well as the post-test questionnaire obtained a test aggregate of A and performed better.

5.4.4.7 DUT (DS1) Findings

The study has found varying test results in groups across all grades. All groups performed well in the test. However, the performance of group PTA, which was taught in English only, was lower than the other groups.

From the rules produced by the algorithm, a 100% correlation has been found in the PTB group. The group consisted of 36 participants, which were taught in isiZulu first and then in English. The conclusion drawn from the results demonstrates that if learners are first taught in isiZulu first and then instruction is followed through in English, there is evidence of improvement in their performance.

5.4.5 Summary

Measurements using different approaches were used and were carefully analysed to yield the results that were achieved. English was identified as a challenge in teaching and learning. Although learners thought that English was important for their education and communication, they still wanted isiZulu language to be used in conjunction with English, in order to help them understand technology better. A clear correlation between teaching in isiZulu followed by English indicated a better understanding of the subject matter. Hence, an improved test results. All participants dedicated their time to work on the project and committed themselves throughout the field study process. IsiZulu was also recognised as being an important language to the Zulu nation.

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 Introduction

The final chapter begins with a summery of the study and the results presented in the thesis. Suggestions for future research are given and the thesis concludes with final remarks.

6.2 What was learnt

The translation project has opened many avenues for the Durban University of Technology. Not only did the translation@thon bring together separate and independent departments within the institution, but it also attracted the organisations such as Translate.org.za, which played a major role in the success of the project. The university was recognised by various media, including national television. The project has set a trend by making technology accessible to the PTD communities of KwaZulu-Natal province, thus adding value to the name 'the Durban University of Technology'.

In this section, the lessons identified are discussed in three sections. The first section provides highlights of the newly discovered knowledge in the field of Information Technology. The next section discusses lessons learnt in the language field and the last section combines various aspects of knowledge.

6.2.1 Information Technology knowledge

In KwaZulu-Natal schools, the majority of Black African learners are from a language background other than English. Although many of these learners are fluent in English in informal conversational contexts, such learners may not always be able to control the English language associated with computer learning and literacy. Hence, learning computers in a second language is not a set of easy steps that can be programmed easily. However, cultural differences in language and computer learning should not be seen as deficiencies but should be used to facilitate learning.

The overall IS 1 course mark has revealed that insufficient exposure to computers causes disparity in knowledge and ability amongst learners in the same class at tertiary level. Hence, learning in the classroom does not accommodate the delays in learning of every learner, as lecturers are also governed by time and the syllabus content to be covered. This means that a PTD learner may have to work twice as hard as compared to an average learner with a computer background. For this reason, it is important that schools and institutions provide adequate resources that will assist these learners in becoming Computer Literate. The analysis of the results has shown a 98% response from learners at schools who indicated that Computer Literacy in isiZulu should be started at a school level. On the other hand, it should also be considered that the delay in technological support could create a negative attitude towards the learning of computers as could be seen from the results from the schools sample. As a result, learners may end up underestimating the importance of Information Technology learning, since very little attention is given to assist schools to start or continue Information Technology education.

The results of the study have demonstrated that the levels of understanding of Information Technology can be improved if more attention is paid to the educational needs of the learners, including good infrastructure, learner grading and support. A 100% response by DUT (DS1), PartTime B group has shown an overwhelming improvement of subject matter, when learners are introduced to new sections first in isiZulu then in English. The language issue, which is discussed in the next section, was identified as a major problem by 97% of the DUT (IS1) sample. The challenge may seem alien or even less important in the IT field to an average IT user. However, the reality is that the technology implementations have not yet reached every single individual in SA and until this is done, solutions need to be implemented in order to enhance and promote faster learning of IT. The localisation project has received 90% support from the schools sample, as an indication of learners' enthusiasm to engage in technology projects.

6.2.2 Language knowledge

The analysis has shown that language plays a major role in learning. At least 97% of the respondents in the DUT (IS1) sample indicated that the English language is a problem. Richards and Rodgers (1986) refer to language as a vehicle for communicating meanings and messages. 83% of the respondents from the pilot study indicated the importance of English second language as a language of international contact. These results demonstrate the importance of language in education. However, the study has re-emphasised the role of language through its importance in the learning of computers. The user interface language facilitates communication between a computer and the end user.

The study has identified the importance and roles of both the first and a second language. South Africa is a diverse country, consisting of 11 official languages, spread across the borders (Zulu, 2005). IsiZulu was recognised as one of the official languages by 99% of the respondents in the pilot study. For communication purposes and uniformity, the English language is currently being used as an official language in education. This is shown by the 83% response of the pilot study and 86% of the DUT (IS1) sample. Participants valued the importance of English in many ways, as such 80% of the DUT (IS1) participants felt that it should be introduced from the beginning. However, 37% of the respondents in the pilot study felt that they were forced to learn in English. In the same manner, isiZulu was viewed as important. 97% of the DUT (IS1) sample in the pre-test questionnaire thought that they could understand their studies better in isiZulu, with the post-questionnaire revealing a 100% response on the importance of the isiZulu language in studies. Although some respondents indicated their fear of not finding jobs if they qualified after having learnt the technology through the medium of isiZulu, they still rated both languages as important, culturally and academically. At least 93% of the respondents in the field study were happy to use both languages interchangeably.

During translations, it was also discovered that languages in general are complicated. There is a difference between the written and spoken language. Indigenous languages are not used to teach all subjects, which makes them difficult to read and write. When asked about their written proficiency in isiZulu, 5% of the respondents in the field study could not write and 8% could not rate their levels in isiZulu. It was also identified that, even though all the

respondents were isiZulu language speakers, 89% of the respondents in the pilot study thought that the written OpenOffice.org.za software looked different to the isiZulu they know.

Ellis (1994) warns that, a written language has to be accurate in its context, which brings up a challenge in the translations of IT applications. The similarities in the Nguni languages made it even more challenging for the study to translate documents such as the questionnaire and computerised tests as some words were found to be very similar. For instance, 'angazi' in isiZulu and 'andazi' in isiXhosa meaning 'I don't know' in English, look similar, with the only difference being the 'g' and 'd', which may sometimes be misread. To ensure the quality of the translation of an IT application, strict quality control is required. The participation from the Language and Translation Department contributed greatly in making sure that these translation anomalies were kept at a minimum.

6.3 What remains to be learnt

Education still remains a key area needing research. There are many other areas in the IT field that are associated with education. A step into Information Technology education from little or no technological background is a giant leap. A good starting point would be to first make way for electricity to be available to PTD areas, so that the work of implementing technology resources can be started. For new projects, sponsoring companies may find it difficult to sponsor computers to schools without proper infrastructure like electricity. Many schools, even though they have computer laboratories, still have a problem of computer networking. Companies like Telkom make provisions for better communications, thus it is essential for the

researchers to assist in the networking research, so that teachers as well as the learners can be able to utilise email services.

Other areas of attention include the computer hardware, in terms of the machine performance, and possible upgrades where necessary.

6.4 Limitations of the study

A number of limitations were identified and reported in chapters 1, 4 and 5. Some of these limitations had a great impact in the study. During the pilot study, it was discovered that learners had minimal computer background, which made it difficult for them to relate to the IT context. The shortage of computers as well as the capability of the computers in terms of requirements that were available also had a great impact, as the OpenOffice.org.za software could not be installed in the computers at schools. As a result, learners could only explore the OpenOffice.org.za software on the demo machines. There was also a very wide gap in the syllabus content between the schools. In some schools, even though Computer Literacy levels were low, at least basic introduction to computers had been done, whereas in other schools very little work had been covered. There is still a great ignorance about Information Technology education, as not much emphasis is put on ensuring that learners understand the benefits if IT education. Some schools had old computer equipment, which was not compatible with OpenOffice.org.za. Other limitations are discussed next.

6.4.1 Sample selection

The sampling method, which was a non-probability sampling method, prevents results from being generalised. However, valuable insights were gained nonetheless.

6.4.2 Survey instruments

It was disappointing to see the pilot study limited by the conditions described in 6.4 above. However, the questionnaire was constructed in such a way that even though learners did not necessarily get a chance to use the software as they would have wanted and as was desired by the researcher, they could still respond from personal experiences and also from what they had seen presented to them.

6.4.3 General limitations

Other limitations that were identified include the lack of technical skills, lack of financial resources and the lack of technological infrastructure and equipment in schools. These limitations could have an impact on future IT research projects in schools.

6.4.3.1 Lack of technological skills

In many KZN PTD schools, Computer Literacy is a challenge. Most teachers have no access to computers, hence they lack skills in the use of computers. In some schools, computers are used for administration purposes and only administrators have access to computers. Thus,

sometimes teachers and the school management have no contact with a computer. The management and teachers have to be educated before Information Technology education is introduced into a school so that they understand and acknowledge the usefulness of Information Technology. In many instances, teachers do not appreciate the need for Information Technology, which limits chances to attract technology projects in these schools. Computer Literacy teachers themselves lack computer skills. For example, many teachers failed to give a response to a question on processor speed.

6.4.3.2 Shortage of technicians

Computer teachers are not involved in the installation and repairing of machines and can only wait for the technician to attend to the technicalities of a computer when break downs occur, thus causing further delay before a computer can be used.

In most KZN PTD schools, there are no technical experts on computer systems or Information Technology. This makes the servicing of computers difficult. Very few Black African technicians from rural areas work in their hometowns after they graduate. This is because of the shortage of Information Technology jobs as a result of underdevelopment in these towns. Hired technicians, disappear soon after fixing the problem and do not come back to service the equipment. Most of the equipment is out of date, hence the spares needed to repair them are difficult to obtain.

6.4.3.3 Lack of financial resources

In South Africa, schools are allocated funds every year by province. KwaZulu-Natal is one of the largest provinces in the country. Schools are allocated a budget from the local government office.

A large sum of money goes to the building projects and little goes to Information Technology education. On the other hand, computer equipment is expensive, making it difficult for schools to replace old equipment. As a result, many computers did not have CD ROM's or a network and therefore OpenOffice.org.za software, which is only available on CD, could not be installed on school computers, thus preventing learners from using the software. Teachers and learners are in no position to afford to buy personal computers. It was also discovered that learners still have difficulties understanding windows basics and a word processor and, as a result, the majority of schools had only covered the word processor in the syllabus. Control groups and tests could therefore not have been used as a good method of collecting data in a situation where learners are not adequately trained to use a computer.

6.5 Benefits of the study

The research was one of a kind. It has attracted a lot of attention in many ways including the following:

6.5.1 The software allowed flexibility for improvements, where people could always add options or tailor software to their preference.

6.5.2 The community was involved, therefore providing more flexibility for feedback

6.5.3 The involvement of NGO's, such as Translate.org.za, whose mission is to translate open source software into South African languages.

6.6 Recommendations

This section is subdivided into three categories, which all play a major role in making Information Technology education a success.

6.6.1 Schools and DUT recommendations

6.6.1.1 Each school needs to set a clear plan that recognises the importance of languages in Information Technology education. The study has shown a magnificent 100% response in the pilot study, where the respondents thought they could understand concepts better when learning in their first language. Another overwhelming 100% response was obtained from the DUT (IS1) pre-test questionnaire, where the respondents thought that the isiZulu software should be introduced at school level. The analysis demonstrated a very close link in the way that these two samples acknowledged the need to learn the software through the medium of isiZulu.

6.6.1.2 All learners need to have an opportunity to use various languages in the user interfaces to support their computer learning. At least 93% of the

learners in the pilot study thought that learning computers in both isiZulu and English would help them overcome the language problem.

6.6.1.3 Schools must pursue funding strategies to provide the necessary technology development.

It is also the responsibility of a school body to acquire knowledge on how they could improve the systems of the school through a series of projects and assistance from the sponsors. This would benefit learners as well as teachers. Moreover, it would assist the schools in ensuring that adequate development for effective technology use is always provided. Thus attracting more learners to Information Technology education.

6.6.2 Teachers recommendations

6.6.2.1 Teachers need to become familiar with technology standards and must consult with universities of technology. In many instances, these institutions are much better equipped than schools in terms of the knowledge base, the accessibility of new technologies and others. It is therefore important that teachers use the opportunities to collaborate with higher education institutions so that they can teach relevant topics at all times. Moreover, it would enhance the learning experience for learners when they see the relationship between the work done at school

and at the university. Teachers of Information Technology education need to realise that the continuing changes in technology mean continuing growth for them. Learners look out to the teachers for technology solution. When asked about what they thought if isiZulu teachers taught software packages in isiZulu, almost 99% of the respondents in the pilot study as well as the 89% of the DUT (IS1) sample, saw this as a good alternative.

6.6.2.2 Teachers could form study groups to explore issues and identify strategies for improving technology use. Teamwork has always been more advantageous that working individually and it is important that teachers also form their own teams, so that they, themselves, can act upon situations that need immediate attention.

6.7 Conclusion

The conclusion summarises the questions identified in chapter 1.

The study has shown that learners equally recognise English and isiZulu as languages that play a major role in their lives. IsiZulu is not only seen as an official language but learners also value isiZulu as their cultural language. On the other hand, English is seen as an important language of international contact and a language of liberation. Learners also understood the importance of English in businesses and in studying overseas.

The focus of this study related to the language aspect and its relationship to Information Technology education. It was, therefore, seen as important to keep the language as the key aspect under investigation, and, hence, many of the questions related to the learners' feelings about the language and how it affected them in their understanding.

The beliefs that were expressed by the learners with regards to dual-medium technology were positive. Almost all samples (97% of the DUT (IS1) sample, 100% of the DUT (DS1) PartTime B (PTB) group and 93% of the schools' pilot study) believed that the language problem could be overcome by introducing isiZulu as the medium of instruction in the IT learning environment. Thus, 97% of the DUT (IS1) respondents in the post-test questionnaire agreed that the use of isiZulu in IT would help them overcome the language problem.

The results of the DUT (IS1), English and isiZulu computerised tests and the DUT (DS1) language exposure and test have proven the hypothesis of the study, as the average scores of the results (IS1) of the pre-test (78%) and post-test (93%) reflected an improvement by 15%.

Amongst other limitations identified are the hardware and software, which often pose problems for teachers in the classrooms, hence technical support is not sufficient to solve these problems. Teachers still lack the motivation to learn Information Technology. Initial technology funding is not sustained thus not capable of providing upgrades, maintenance, and ongoing professional development. Budgeting for technology presents schools with more problems. For example, a computer purchased as recently as four years ago is less compatible today, and incapable of running the most recent versions of software. Another issue is access to computers from home. While some learners do have computers in their homes, the larger majority do not. This also creates many problems in terms of unevenness in the learning of computers.

7. References

Absi, A. 2003. *Software localization services* [online]. Available: http://www.horizons.com.lb/Localize.html#anchor178330, [Accessed 8 July 2003].

Adams, C. 2001. *Open Office Community.* [online] Available: http://www.openoffice.org.za, [Accessed 2 March 2001].

Allwood, C.M. and Wang, Z.M. .1990. Conceptions of computers among students in China and Sweden, *Computers in Human Behavior,* 6, 185-199.

Ally, I. 2004. Interviewed by M. Njobe. Durban Institute of Technology, Durban 05 May 2004 12:30.

Bailey, D. 2003. *About Translate.org.za*. [online] Available: http://translate.org.za/content/view/1587/53/, [Accessed 3 February 2003].

Bailey, D. 2004. Interviewed by M. Njobe. DUT Information Technology, Durban, 5 May 10:00.

Bruhns, E. and Hoffmann, E. C. 2005. Language skills facilitating effective computer literacy. Paper delivered at the SAARDHE conference on the African University in the 21st Century. University of KwaZulu-Natal, 27-29 June 2005.

Burns, M., Griffin, P., and Snow, C. 1999. *Starting out right: A guide to promoting children's reading success.* The National Research Council. Washington, DC: National.

Buttaro, L. 2004. Second-Language Acquisition, Culture Shock, and Language Stress of Adult Female Latina Students in New York. *Hispanic Higher Education Journal 3(1) 21-28.*

Casebeer, L. and Verhoef, M. 1997. Combining Qualitative and Quantitative Research Methods. *Chronic diseases in Canada Journal*, 18(3):6-8.

Cox, M. and Marshall, G. 2005. Effects of ICT: Do we know what we should know?. Paper delivered at the 8th IFIP world conference on computers in education. University of Stellenbosch, 4-7 July 2005.

Cretcheley, P. 2005. Does computer confidence relate to levels of achievement in ICT-enriched learning models?. Paper delivered at the 8th IFIP world conference on computers in education. University of Stellenbosch, 4-7 July 2005.

Cruger, M. 2005. The parent letter. NYU *Child Study Center Journal*, 3(7):1-2.

Crystal, D. 1997. *English as a global language.* [online] Available: http://titles.cambridge.org/catalogue.asp?isbn=0521530326, [Accessed 06 June 2001].

Dalvit, L. 2004. *Attitudes of isiXhosa-speaking Students at the University of Fort Hare towards the use of isiXhosa as a Language of Learning and Teaching*. M.A thesis, Rhodes University, South Africa.

Department of Health and Human Science. 2005. *Understanding the impact of language differences on classroom behavior*. [online] Available: http://csefel.uiuc.edu, [Accessed 19 December 2005].

Drenoyianni, H. 2005. Skills of Greek initial teacher education students. ICT Conference, Cape Town.

DUT Library. 2004. *Referencing Guide: Using the Harvard Referencing System. DUT:*Durban University of Technology Press.

DUT. 2006. *History*. [online] Available: http://www.dut.ac.za/?008,2, [Accessed 5 January 2006].

Ellis, R. 1994. *The study of second language acquisition*. Oxford: Oxford University Press.

Erasmus, A. 2002. *Microsoft Community Investment Policy*. [online] Available: http://www.microsoft.com/southafrica/community, [Accessed 10 May 2002].

Evers, V. and Day, D. 1997. The role of culture in interface acceptance. Paper delivered at the *Human Computer Interaction Conference: INTERACT'97,* Darling Harbour Convention Centre, Sydney 14-18 July 1997.

Fitzgerald, A.2000. *Quantitative Vs Qualitative*. [online] Available: http://www.answersresearch.com/article9.php, [Accessed 16 March 2006].

Ganzalez-Barahona, D. and Rables, L. 2004. Analysing the anatomy of GUI/Linux distribution. In Koch, S. (ed.) Free/Open Source Software Development. Group Inc (IGI). 27-32.

Genesee, B. 2000. *Brain Research: Implementations for L2 learning*. [online] Available: http://www.cal.org/resources/digest/0012brain.html, [Accessed 18 March 2005].

Goodman, A. 2001. *Designing with the user in mind.* [online] Available: www.deakin.edu.au/~agoodman/scc313/user.html, [Accessed 20 May 2002].

Greenberg, S. 1999. *Teaching human computer interaction to programmers*. SIGCHI Bulletin, 28(2), 5-6.

Grewan, R. 2002. *SCHOOLNET projects.* [online] Available: http://www.school.za/projects/thintana/index.htm, [Accessed 06 November 2001].

Gumede, C. 2004. Interviewed by M. Njobe. Durban Institute of Technology, Durban 07 May 2004 12:30.

Hall, A.V. 2003. *Bridging the Digital Divide, the Future of Localisation*. [online] Available: http://www.unesco.org/webworld/public_domain/kothmale.shtml, [Accessed 17 June 2004].

Heller, M.F. 1995. *Reading-writing connections from theory to practice.* United States of America: Longman Publishers USA.

Hitherington, E. 1980. *How language works*. Los Angeles. Cambridge, Massachusetts: Wonthrop publishers, Inc.

Hofstede, G. 1991.*Cultures and Organisations: Software of the Mind,* McGraw-Hill: New York.

Heukelman, D. 2006. Can a user centred approach to designing a user interface for rural communities be successful? Paper delivered at CHI-SA conference, ICC, Cape Town January 2006.

Hugo, J. 2000. *Human Computer Interaction* [online]. Available: http://www.chi-sa.org.za/articles/HCIchallenge.htm, [Accessed 8 July 2003].

Witten, H and Frank, E. 2005 *Data Mining: Practical machine learning tools and techniques*. San Francisco: Morgan Kaufmann.

Johnson, B. and Christensen. L. 2003. *Educational Research: Quantitative, Qualitative, and Mixed Approaches*. United Stated of America: Addison-Wesley.

Keniston, K. 1997. *Notes on technology and culture.* [online] Available: http://www.mit.edu/people/kken/FILES/pubs.htm, [Assessed 28 May 2003].

Klimpacher, R. 1998. *Information Technology in South Africa.* [online] Available: http://gurukul.ucc.american.edu/initeb/fklimpa/southafrica/humapage.html, [Accessed 15 May 2002].

Language Center. 2003. *Writing up research*. [online] Available: http://www.languages.ait.ac.th, [Accessed 20 May 2005].

Lanham, L. and Prinsloo, K. 1978. *Language and communication studies in South Africa: Current issues and directions in research enquiry*. Cape Town: Oxford University Press.

LMU Association of University Teachers. 2003. *Glossary of Assessment Terms*. [online] Available: http://www.Imuaut.demon.co.uk/trc/edissues/assgloss.htm#sectA, [Accessed 23 January 2006].

MacDonald, C.A. 1990. *English Language Skills Evaluation: A Final Report of the Threshold Project*. Pretoria: Human Sciences Research Council.

Magariños, D. 2000. *Localization.* [online] Available: http://groups.google.com/groups?q=localization+of+software+for+different+cultures&hl=en&lr=&ie=UTF-8&selm=389E081C.3960F104%40wipethis.arrakis.es&rnum=9, [Accessed 8 July 2003].

Martindale.L. 2002. *Bridging the Digital Divide in South Africa*. [Online] Available: http://www.linuxjournal.com/article/5966 [Accessed 6 February 2003].

McLaughlin, B., Blanchard, A., and Osanai, Y. 1995. *Assessing language development in bilingual children.* Washington, DC: George Washington University, The National Clearinghouse for Bilingual Education.

Melville, S. and Goddard, W. 1996. *Research Methodology : An Introduction for Science and Engineering.* Juta and Co Ltd: Creda Press.

Meskill, C.2005.Triadic Scaffolds: Tools for teaching English language learners with computers. *Language Learning and Technology Journal*, 9(1): 46-59.

Microsoft. 2003. *Microsoft launches isiZulu Language Interface Pack for Windows XP to preserve culture and enable access to technology.* [online]

Available:http://www.microsoft.com/southafrica/press/press-810.mspx, [Accessed 02 May 2004].

Moher, B., Nortrop, R. and Petty, R. 2003. On the up-and-up, but only those with a built-in ROI. [online] Available: http://www.darwinmag.com/read/120103/techpredict.html, [Accessed 16 December 2005].

Myers, M. 1997. *Qualitative Research in Information Systems*. [online] Available: http://www.qual.auckland.ac.nz, [Accessed 14 May 2005].

Myers. B. A. 1998. brief history of Human Computer Interaction Technology. *ACM interactions Journal*, 4(2) 44-54.

National Center for Research on Cultural Diversity and Second Language Learning (NCRCDSLL). 1995. *Teaching and learning.* [online] Available: http://www.cal.org/pubs/ncrcpubs.html#EPR, [Accessed 06 November 2002].

Neill, J. 2004. Qualitative versus Quantitative Research: Key Points in a Classic Debate. [online] Available: http://www.wilderdom.com/research.html, [Accessed 20 May 2005].

Ntuli, K. 2002. *IEC donated computers*. *Isolezwe*, December 7.

Olivier, O. 2001. *The Voices of the Rainbow Nation.* [online] Available: http://salanguages.com, [Accessed 20 May 2004].

Omar, M.H. 1992. Attitudes of college students towards computers: A comparative study in the United States and the Middle East, *Computers in Human Behaviour,* 8, 249-257.

Plass, L. Design and Evaluation of the user interface of foreign language multimedia software: a cognitive approach. *University of Mexico Journal*, 2(1) 35-45.

Richards, C and Rodgers, S. 1986. *Approaches and methods in language teaching: A description and analysis*: Cambridge university Press.

Rob, P and Coronel, C. 2007: *Database Systems Design, Implementation, and Management* . United States of America, Thomson Learning Inc.

SAPA, 2002 *African languages*. *Isolezwe*, November 2.

Shneidarman, B. 1998. *Designing the user interface: Strategies for effective human-computer interaction*. United States of America, Addison-Wesley.

Souphavanh, A. and Karoonboonyanan, T.2005. *Free/Open Source Software: Localization.* [online] Available: http:// www.iosn.net/L10N/foss-localisation-primer/ foss-localisation-primer.pdf*, [*Accessed 16 July 2005].

South Africa. *Open Software and Open Standards in South Africa*. 2002. National Advisory Council on Innovation. Pretoria: Government Printer.

South Africa. Department of Education. 2001. National Strategy for Mathematics, Science and Technology Education Report. Pretoria: Government Printer.

South Africa. Department of Science and Technology. 1998. *Strategic Foresight Youth Report* 1998. Pretoria: Government Printer.

South Africa. Department of Science and Technology. 1998. *Strategic Foresight Youth Report* 1998. Pretoria: Government Printer.

South Africa. Department of Science and Technology. 2002. IST2002 conference: Bridging the divide. Cape Town: Government Printer.

South Africa. Department of Science and Technology. 2002. IST2002 conference: Bridging the divide. Cape Town: Government Printer.

South Africa. Department of Science and Technology. 2003. *Parliament Media Briefing*. Cape Town: Government Printer.

South Africa. Department of Science and Technology. 2003. *Parliament Presentation.* Cape Town: Government Printer.

South Africa. Department of Statistics. 2003. *Education statistics in South Africa at a glance in 2001*.Pretoria: Government Printer.

Thearling, K. 2007. *An Introduction to Data Mining* [online] Available: http://www.thearling.com/, [Accessed 14 May 2007].

Translate.sourceforge.net. 2003. [online] Available:http://translate.sourceforge.net/, [Accessed 20 May 2004].

United States of America. *Understanding the impact of language differences on classroom behaviour*. 2005. Center on the Social and Emotional Foundations for Early Learning. US: Government Printer.

Weir, R.S. and Lepouras, G. 2003. *Tools for Second Language Support.* [online] Available: http://www.cis.strath.ac.uk/research/publications/papers/strath_cis_publication_171.pdf, [Accessed 10 May 2005].

Weir, R.S. and Lepouras, G. 2003. *First Language anomalies.* [online] Available: http://www.cis.strath.ac.uk/research/publications/papers/strath_cis_publication_421.pdf, [Accessed 14 May 2005].

Wheeler, D. 2005.Why Open Source Software / Free Software (OSS/FS, FLOSS, or FOSS)? Look at the Numbers!. [online] Available: http://www.dwheeler.com/oss_fs_why.html, [Accessed 17 December 2005].

Williams, D. and Snipper, G.C. 1990. Literacy and bilingualism: Longman, New York and London.

Williams, K. and Sawyer, C.2003.*Using Information Technology*. New York: McGraw-Hill.

Yeo, A. 1996. Cultural user interfaces: a silver lining in cultural diversity. *ACM SIGCHI Bulletin*, 28(3) 4-7.

Zulu, P.2005. Interview by M.Njobe. University of KwaZulu-Natal, Durban, 06 April 11:00.

APPENDIX A

ENGLISH VERSION OF THE QUESTIONNAIRE

Dear Participant

My name is Mandy Njobe and I am correctly studying for a master's degree in the field of Information Technology at the Durban Institute of Technology, in Durban.

I am conducting a research on the localisation of the User Interface into isiZulu language. This research aims to make the computer interaction between isiZulu speaking users and computers better. By localising English software into isiZulu, it is hoped that the levels of understanding of the isiZulu speaking, computer users will be increased.

This questionnaire is part of this research, it seeks to collect evidence needed in order to determine your level of understanding of the isiZulu and English languages in the user interfaces of an OpenOffice.org.za application. Filling in this questionnaire should take approximately 10 minutes.

It would be greatly appreciated if you could take a few minutes to complete it.

Yours Sincerely

Mandy Njobe

Cell: 072 1763 182

Part 1: Kindly tick **ONLY ONE** of the available options

	Agree	Disagree	Don't know
1. I speak isiZulu well.			
2. I write well in isiZulu.			
3. I read well in isiZulu.			
4. My English is **NOT** good enough to cope with Information Technology studies.			
5. IsiZulu OpenOffice.org.za software looks different to the type of isiZulu I know.			
6. IsiZulu OpenOffice.org.za software should be introduced at a school level.			
7. Using English and isiZulu languages in Information Technology education can help learners to overcome their language problems.			
8. I'd rather study Information Technology in isiZulu and learn how to translate my knowledge into English, than to study everything in English.			
9. IsiZulu-speaking teachers can be of great help if they can teach software packages in isiZulu.			

Part 2: Kindly tick **ONLY ONE** of the available options

10. English should be introduced as the language of learning and teaching:

- ❖ from the very beginning.
- ❖ in secondary school.
- ❖ during lower primary school.
- ❖ at university.
- ❖ never (it should just be studied as a subject).

11. The most important language problem in Previously Technologically Disadvantaged schools is:

- ❖ that most students don't speak English well enough.
- ❖ students are forced to study in English which, for most of them, is a second language.
- ❖ there is no language problem.

Part 3: If you wish, you **MAY TICK MORE THAN ONE** of the available options

12. IsiZulu is important:	• as an official language. • because it will help me to get a job. • because it is the language of my people. • other: _____.
13. To study in isiZulu:	• would make me feel more confident. • would help me understand things better. • would help me get higher marks. • other: _____ .
14. English is the language of:	• international contact. • division. • public affairs. • ambition. • liberation. • tertiary education. • corruption. • oppression. • national unity. • other: _____.
15. If Information Technology learning becomes a dual medium (English and isiZulu), its graduates:	• will have a better understanding of the topics they have studied. • will still speak English as well as they do now. • will have more problems finding jobs. • will have more problems continuing their studies abroad.

Part 4: Kindly tick **ONLY ONE** of the available options

16. Would you recommend the use of isiZulu OpenOffice.org.za to anyone else?	Yes	No	Don't Know
17. Do you think that Tholulwazi and Translate.org.za should carry on with software translation into isiZulu?			

You are welcome to use another piece of paper if you have any other suggestions you may want to add.

END OF QUESTIONNAIRE

THANK YOU

APPENDIX B

ISIZULU VERSION OF THE QUESTIONNAIRE

IMIBUZO EBHALWE NGOLWIMI LWESIZULU

Mbambiqhaza ohloniphekile

Igama lami ngingu Mandisa Njobe, ngenza izifundo zebanga eliphezulu kumkhakha wezochwephesho lwamakhompyutha esikhungweni semfundo ephakeme yobuchwepheshe i- Durban Institute of Technology, emaphakathi neTheku.

Ngiphanda ngohlelo lokuhumusha amatemu okuxhumana komuntu nekhompyutha ngolwimi lwesiZulu. Loluphando luhlela ukwenza kangcono ukuxhumana kwabantu abakhuluma isiZulu kanye nekhompyutha, ukuze kwande izinga lokufunda kwabo izifundo zekhompyutha.

Lemibuzo yingxenye yaloluphando olubhekele ukuthola ubufakazi obudingakalayo ukukala ulwazi lwakho lwesiZulu nesiNgisi uma uxhumana nohlelo lwekhompyutha lwe-OpenOffice.org.za. Ukuphendula lemibuzo kuzokuthatha isikhathi esingangemizuzu eyishumi.

Ngingajabula kakhulu uma ungase uthathe imizuzwana uyiphendule.

Ozithobayo

Mandy Njobe

Ucingo: 072 1763 182

Isigaba sokuqala: Siza ukhethe OKUKODWA kulamabhokisi angezansi

	Ngiyavuma	Angivumi	Angazi
1. Ngisikhuluma kahle isiZulu.			
2. Ngisibhala kahle isiZulu.			
3. Ngisifunda kahle isiZulu.			
4. IsiNgisi sami asikulungele kangako ukumelana nezifundo zolwazi lobuchwepheshe bamakhompyutha.			
5. Izinhlelo ze-OpenOffice.org.za yesiZulu zibukeka zehlukile kunalesi engisaziyo.			
6. Izinhlelo zesiZulu ze-OpenOffice.org.za kumele ziqale ukufundiswa ezikoleni.			
7. Ukusebenzisa isiNgisi kanye nesiZulu ekufundisweni kolwazi lobuchwepheshe bamakhompyutha kungasiza abafundi ukunqoba izinkinga zolwimi.			
8. Kungcono ngifunde izifundo zolwazi lobuchwepheshe bamakhompyutha ngesiZulu bese ngifunda ukuthi ngingase ngiluhumushe kanjani ulwazi esinNgisini kunokuthi ngifunde konke ngesiNgisi.			
9. Othisha abakhuluma isiZulu bangaba usizo olukhulu uma bengase bafundise izinhlelo zamakhompyutha ngesiZulu.			

Isigaba sesibili: Siza ukhethe OKUKODWA kulemibuzo

10. IsiNgisi kumele siqalwe ukufundwa nokufundiswa:

- Ekuqaleni.
- kumabanga aphansi.
- kumabanga athe thuthu.
- kumabanga aphezulu.
- lutho (kumele sifundwe njengesifundo).

11. Okuyinkinga ebalulekile ezikoleni ezazincishwe amathuba okufunda ezobuchwepheshe bamakhompyutha ukuthi:

- iningi labafundi abasikhulumi isingisi kahle.
- abafundi kuphoqelekile ukuthi bafunde ngesingisi, okuwulwimi lwesibili lwabaningi.
- ayikho inkinga yolwimi.

Isigaba sesithathu: Uma uthanda ungakhetha OKUNGAPHEZU KOKUKODWA kulokhu okulandelayo:

12. IsiZulu sibalulekile:	• njengolwimi olusemthethweni. • ngoba sizongisiza ekutholeni umsebenzi. • ngoba ulwimi lwakithi. • okunye: _____.
13. Ukufunda ngesiZulu:	• kungenza ngizizwe ngizethemba kangcono. • kungenza ngazi izinto kangcono. • kungasiza ekutholeni amaphuzu athe thuthu. • okunye_____.
14. IsiNgisi ulwimi:	• lokuxhumana kwizwe lonke. • lokuqhekeka. • lwezindaba zomphakathi. • lokuziqhenya. • lwenkululeko. • lwemfundo ephakeme. • lomkhonyovu. • lwengcinezelo. • lobunye. • okunye: _____.
15. Uma ukufundwa kolwazi lobuchwepheshe bamakhompyutha lungaba kabili (isiNgisi nesiZulu), izifundiswa zamajazi:	• zingathola ukwazi kabanzi ngezinto abazifundile. • zingaqhubeka nokukhuluma isingisi njengoba zenza manje. • zingaba nezinkinga eziningi uma zifuna umsebenzi • zingaba nezinkinga eziningi uma ziqhubeka nokufunda phesheya.

Isigaba sesine: Siza ukhethe OKUKODWA

16. Ungakugqugquzelela yini ukusetshenziswa kwesiZulu kwizinhlelo ze-OpenOffice.org.za komunye umuntu na?	Yebo	Cha	Angazi
17. Uyacabanga yini ukuthi iTholulwazi kanye ne-Translate.org.za kumele yini ziqhubeke nokuhumusha izinhlelo zamakhompyutha ngesiZulu?			

Uvumelekile ukuthi usebenzise elinye ipheshana eliseceleni umangabe uneminye imibono ofuna ukuyifaka.

ISIPHELO SEMIBUZO

NGIYABONGA

APPENDIX C

COMPUTER TEST (PRACTICAL)

DURBAN INSTITUTE of TECHNOLOGY

Department of Information Technology

OpenOffice.org 1.1.1 (Writer) test

DURATION: 30 Minutes

INSTRUCTIONS:

Answer all questions.

Save test to my documents folder as your label name placed in front of you.

1. Create an openoffice.org 1.1.1 document and type the lines below: (6) _____
   - Openoffice.org.za
   - Translate.org.za
   - Tholulwazi
   - Durban Institute of Technology
   - Department of Information Technology
   - Department of Language and Translation
2. Change the line spacing of the document to 1.5 (2) _____
3. Change all text in line 1 to bold (1) _____
4. Underline all text in line 2 (1) _____
5. Change all text in line 3 to italics (1) _____
6. Change the colour of text in line 4 to RED (1) _____
7. Insert a header ‘isiZulu’ and a footer ‘English’ (4) _____
8. Insert a line page border (2) _____

[Total = 18]

APPENDIX D

GENERAL RESPONSES

School A

Learner1: I see it as a very helpful tool for Learners like us.

Learner2: I see it as a brilliant idea; the screens look familiar to what I had seen.

Learner3: I see it as a good product that encourages the use of our language.

Learner4: The product is very good especially for people like us coming from disadvantaged schools where English is not often used like in urban schools.

Learner5: I think it is right for us black people because we do not understand English well.

Learner6: I am very thrilled to know that I can learn computers in my language; it is a very good start.

Learner7: I think this is great; it is time that we learn computers in our language.

Learner8: I like this idea, very much, I now know that I can pass computers with flying colours because I know isiZulu very well, it is my language and the way I have been brought up.

School B

Learner1: I see it as a very good thing because you can understand something in isiZulu if you do not know it in English, especially when you have just started computers, where you do not understand many things.

Learner2: isiZulu is very important to us black people, we should value it and be proud of it, and this interface just tops my statement.

Learner3: I think it is good and I believe we are going to learn a lot from it.

Learner4: It sounds very interesting and I like the way it is represented.

Learner5: It is good because we can do technology in our culture, which makes us a part of this big thing, happening.

Learner6: I agree with what have been said and I think that it will make a difference and we should not fear using computers anymore.

Learner7: Computers have been a nightmare for some of us, I think that this interface will make a difference and change that.

School C

Learner1: It is right and better especially now that we are given a choice to do what we like in a language we like; I think computers are now going to be very interesting. Also that since we have been using computers in English, we had problems pressing the wrong buttons and reacting to some prompts we do not understand making a lot of mistakes in the process, now everything is going to be easier and better hopefully no more mistakes.

The following learner responded negatively

Learner2: I would think that isiZulu would come with difficult terms because it can be complicated at times and you sometimes prefer English because of the familiar terms.

Learner3: I think it is good because a lot of people understand isiZulu in our school, you sometimes find that people get 80% results in isiZulu tests and less in English, which clearly demonstrates that English is hard for many of us. This will also encourage the use of our language; it makes us proud to have you in our school because it shows that our school is capable of doing something.

Learner4: At the moment English is a very complicated language for me and others, I am sure that many people will now enjoy using computers in their language.

School D

Learner1: I think it is better since some of us do not understand English and this is going to help us learn.

The following learner responded negatively

Learner2: For me it is a bit difficult since I have been brought up in English background although I am now studying in a black school, but I would think that it would be of a good help to others.

Learner3: This is what we call freedom, it is good and it makes us proud to use technology in our language.

The following learner responded negatively

Learner4: I do not think it is such a good idea, English is better than isiZulu for me; I also have an English background.

Learner5: I think this is good, learning computers have been difficult because of English, now we can learn them better in isiZulu.

School E

Learner1: From my side I think what is happening is very right, as you have explained and told us that you have been to a number of schools, some that are worse than ours are. This program is great; it shows that education has progressed in many ways compared to the olden days. But most of all I would think that this interface will work both ways, there are learners coming from English pre-schools and some from different areas of South Africa who really want to learn isiZulu now that they are in black schools.

Learner2: I think it is right, I agree with the previous speaker, English speakers can benefit from this interface, we can help them learn it, and in turn, they can help us learn it in English.

Learner3: I say this interface is right, and it must carry on because it will help us learn better since English is hard to understand.

Learner4: I really agree with all my classmates, although I will appreciate it if you pay us another visit some time and teach us more about computers.

Learner5: It is great it will help us learn with a greater understanding.

School F

Learner1: I see the isiZulu program as a wonderful thing because other people do not understand English.

Learner2: I also see it as a good thing because if you do not understand English terms you can always use an isiZulu window and see what needs to be done.

Learner3: I think this interface is good and it is going to attract people to do computers.

Learner4: This interface is good because it allows us to use our language, which I think is very nice.

School G

Learner1: It is a good programme I am happy now that I am not forced to use English.

Learner2: Learning in English is difficult but learning in isiZulu is easy, this interface will make our learning interesting.

Learner3: I also see this program as a good way of improving our computer skills; many people do not understand English.

Learner4: It is very good, because there can be very difficult terms in English which when you translate in isiZulu can be a lot easier.

Learner5: I think it is right because in English there are buzzwords that we do not understand.

Learner6: This interface is good because other people do not use computers fearing that something will go wrong, now everyone can learn without fear of destroying computers.

Learner7: I say this helps a lot because if you do not understand English, an isiZulu program can guide you.

School H

Learner1: It is good, in some instances, you do not get the English concept well then you prefer isiZulu, especially with computers, they are new to us.

Learner2: It is good because it teaches us computers in our language, which is very good.

School I

Learner1: I am very pleased to learn that something like this exists; I know it will definitely help us and we can be rated evenly to other groups that use English written interfaces.

Learner2: I think this is a great achievement for the black schools to have come this far with technology, now we can learn computers better with this interface.

Learner3: I love my language very much and I value it, this interface is good because it encourages us to use our language and in that, way we are not going to forget our roots.

Learner4: I think this is a great start although it would be better if everything were written in our language; I mean all other scientific resources that are new to us, in that way, we can have better pass rates.

APPENDIX E

REVISION QUESTIONS ON

OPENOFFICE.ORG.ZA (WRITER)

Which menu option would you use to open a new file from OpenOffice.org.za?

Ifayela, vula

Which menu option would you use to insert a picture?

Faka, Imidwebo

Which menu option would you use to configure a window?

Amathuluzi

Which menu option would you use when stuck and needing help?

Usizo

Which menu option would you use to change the format of a document?

Isakhiwo

Which menu option would you use to undo a mistake?

Lungisa, Qaqa

Which menu option would you use to print a document?

Shicilela

Which menu option would you use to exit a program?

Phuma

Which menu option would you use to save a file / document?

Gcina

End of revision

APPENDIX F

PRESENTATION

THOLULWAZI

OpenOffice.org 1.1.2 gives you everything you'd expect in office software.

You can create dynamic documents, analyse data, design eye catching presentations, and produce dramatic illustrations.

If you're used to using other office suites - such as Microsoft Office - you'll be completely at home from day one. However, as you become used to OpenOffice.org 1.1.2, you'll start to appreciate the extras that just make your life easier.

You can of course continue to use your old Microsoft Office files without any problems - and if you need to exchange files with people still using Microsoft Office, that's no problem either.

OpenOffice.org's open licensing model means you are not required to pay licensing fees - just download via the Internet and install. You can give the software away freely to employees, students, customers, friends etc.

System Requirements

Microsoft Windows 98, NT, ME, 2000 and XP: Pentium-compatible PC ; 64 MB RAM, recommended ; 250 MB hard disk space ; min.display 800x600, 256 colours.

Linux: kernel 2.2.13 or higher, glibc2 2.1.3 or higher; Pentium-compatible PC or higher; 64MB RAM recommended; 250 MB hard disk space; X Server with min.800x600, 256 colours.

Sun Solaris 8 Operating Environment: 128 MB RAM recommended; 250 MB hard disk space; X Server with min.800x600, 256 colours.

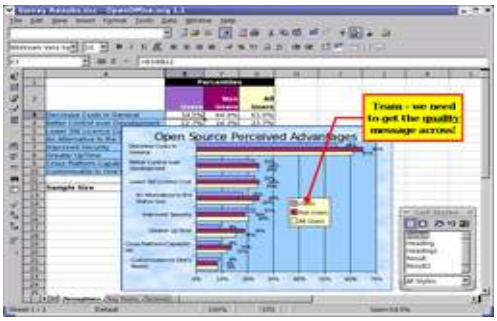
Mac OS X 10.2.x and **Darwin PPC** platforms with XWindows from Xfree86.org.

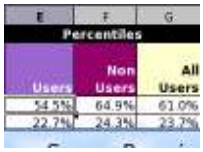
OpenOffice.org Writer

WRITER is a powerful tool for creating professional documents, reports, newsletters, and brochures. You can easily integrate images and charts in documents, create everything from business letters to complete books with professional layouts, as well as create and publish Web content.

OpenOffice.org Calc

CALC is a feature-packed spreadsheet which can turn boring numbers into eye-catching information. Calculate, analyse, and visually communicate your data quickly and easily. Use advanced spreadsheet functions and decision-making tools to perform sophisticated data analysis. Use built-in charting tools to generate impressive 2D and 3D charts.



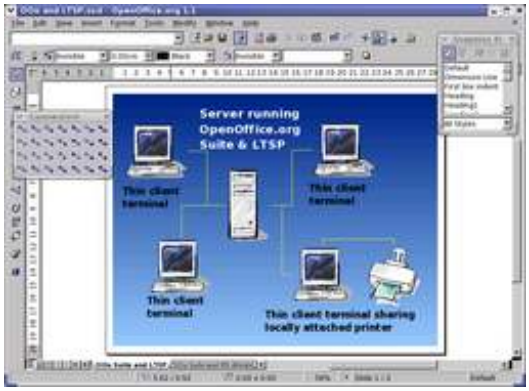


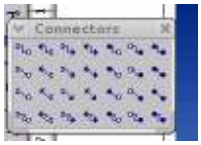
OpenOffice.org Impress

IMPRESS is the fastest, most powerful way to create effective multimedia presentations. Your presentations will truly stand out with special effects, animation and high-impact drawing tools.

OpenOffice.org DRAW

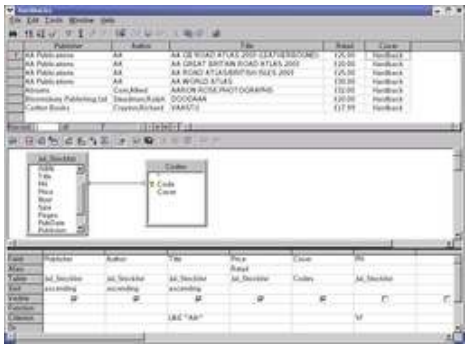
DRAW - from a quick sketch to a complex plan, DRAW gives you the tools to communicate with graphics and diagrams.





OpenOffice.org Databases

Databases are often thought to be strictly for techies. If you don't talk Structured Query Language (SQL), then your database won't talk to you. OpenOffice.org 1.1 changes all that. Its Database User Tools gives you all the tools you need for day to day database work in a simple spreadsheet-like form.



The Suite Advantage

OpenOffice.org 1.1.1 is more than a collection of five superb tools.

- **Unlike some competitors, this suite was not created from a collection of separate pieces of software. From the start, it was designed as one complete office package.**
- **All the packages have a similar 'look and feel' making them very easy to use, with common 'learn once use everywhere' tools like the Navigator and Stylist.**
- **The same tools are used consistently across the suite - for example, the tools you use to work with graphics within Writer are also found in Impress and Draw.**
- **You don't need to know which application was used to create a particular file - you can 'File Open' any OpenOffice.org 1.1 file from anywhere and the correct application will be launched.**

OpenOffice.org

The Suite Advantage (continued)

- All the packages share a common spell-checker, etc.; and if you change an 'Option' in one package, it's changed in them all.
- Information can be transferred easily between all the packages.
- All packages save data in the same industry-standard XML format, with substantial disk space savings compared to common proprietary formats.
- All the packages are installed in one single operation.
- All the packages are released under the same open licensing model - there are no hidden charges now or in the future.

OpenOffice.org

Thankyou and enjoy OpenOffice

APPENDIX G

PERMISSION LETTER

PROVINCE OF KWAZULU-NATAL
ISIFUNDAZWE SAKWAZULU-NATAL
PROVINSIE KWAZULU-NATAL

DEPARTMENT OF EDUCATION
UMNYANGO WEMFUNDO
DEPARTEMENT VAN ONDERWYS

HEAD OFFICE | INHLOKO HHOVISI | HOOFKANTOOR

Address: 288 Pietermaritz Street
Ikheli: Pietermaritzburg
Adres: 3200

Private Bag: X9137
Isikhwama Seposi: Pietermaritzburg
Privaatsak: 3200

Telephone: 033-3552355
Ucingo:
Telefoon:
Fax: 033-3552337

Enquiries: 0824659846
Imibuzo:
Navrae: DR MZ SHAMASE

Reference:
Verwysing: research project

Date:
Datum: 06/10/2004

Ms MANDISA NJOBE
DEPT OF INFORMATION TECHNOLOGY
DURBAN INSTITUTE OF TECHNOLOGY
DURBAN
4000

Dear Ms Njobe

PERMISSION TO CONDUCT RESEARCH IN KWAZULU-NATAL RURAL SCHOOLS

Your request to be granted permission to conduct research in KwaZulu-Natal schools is acceded to subject to the following conditions:

1. *Principals, educators and learners are under no obligation to assist you in your research.*
2. *Principals, educators, learners and schools should not be identifiable in any way from the results of the research.*
3. *You make all the arrangements concerning your research.*
4. *Educators's programmes are not interrupted.*
5. *The research is not conducted during the writing of examinations.*
6. *A photocopy of this letter is submitted to the District Managers where the intended research is to be conducted.*
7. *A brief summary of the content, findings and recommendations is provided to the Office of the CEO, Department of education.*

We wish you success in your research.

Sincere Regards

PROF CRM DLAMINI, SC
CHIEF EXECUTIVE OFFICER

PROVINCE OF KWAZULU-NATAL
ISIFUNDAZWE SAKWAZULU-NATAL
PROVINSIE KWAZULU-NATAL

DEPARTMENT OF EDUCATION
UMNYANGO WEMFUNDO
DEPARTEMENT VAN ONDERWYS

HEAD OFFICE | INHLOKO HHOVISI | HOOFKANTOOR

ADDRESS: IKHELI: ADRES: EX-DURBAN COLLEGE OF EDUCATION CNR. NICHOLSON ROAD AND QUEEN MARY AVENUE UMBILO

PRIVATE BAG: ISIKHWAMA SEPOSI: PRIVAATSAK: X05 ROSSBURGH 4072

TELEPHONE: LICINGO: TELEFOON: 031 2744919

FAX: 031 2744922

Cell: 083 337 1324

ENQUIRIES: IMIBUZO: NAVRAE: S. R. Alwar

REFERENCE: INKOMBA: VERWYSING: Permission: Research

DATE: USUKU: DATUM: 18 October 2004

RE: PERMISSION TO CONDUCT RESEARCH

TO WHOM IT MAY CONCERN

This is to serve as a notice that **Ms Mandisa Njobe** has been granted permission to conduct research with the following terms and conditions:

- That as a researcher, she/he **must** present a copy of the written approval from the Department to the Head of the Institution concerned before any research may be undertaken at a departmental institution.
- Attached is the list of schools she/he has been granted permission to conduct research in. however, it must be noted that the schools are not obligated to participate in the research if it is not a KZNDEC project.
- **Ms Mandisa Njobe** has been granted special permission to conduct her/his research during official contact times, as it is believed that her/his presence would not interrupt **education programmes.** Should education programmes be interrupted, she/he must, therefore, conduct his/her research during nonofficial contact times.
- No school is expected to participate in the research during the fourth school term, as this is the critical period for schools to focus on their exams.

Comments: _____

_____

Thandiwe Zungu
Deputy Director: **Research, Strategy and Policy Development**

Comments: _____

_____

Dr B. H. Mthabela
Director: Research, Strategy Development and ECMIS

APPENDIX H

COMPUTER TEST RESULTS

PRE-TEST

&

POST-TEST RESULTS

Pre-test Results

Learner 1_35	PrePI_6	PreLS_2	PreB_1	PreU_1	PreI_1	PreC_1	PreH_2	PreF_2	PrePB_2	Total	Percentage
L1	6	2	1	1	1	1	0	0	2	14	**77.78**
L 2	4	1	1	1	1	0	2	2	2	14	**77.78**
L 3	6	0	1	1	1	1	0	0	0	10	**55.56**
L 4	5	2	1	1	1	1	0	0	2	13	**72.22**
L 5	6	2	1	1	0	0	2	2	2	16	**88.89**
L 6	6	2	1	1	1	1	0	0	0	12	**66.67**
L 7	6	2	1	1	1	1	2	2	0	16	**88.89**
L 8	4	1	1	0	1	1	2	2	2	14	**77.78**
L 9	6	2	1	1	1	0	0	1	0	12	**66.67**
L 10	6	0	1	1	1	1	2	2	2	16	**88.89**
L 11	6	2	1	1	1	1	0	0	0	12	**66.67**
L 12	6	1	1	1	0	1	2	2	2	16	**88.89**
L 13	6	2	0	1	1	0	0	0	0	10	**55.56**
L 14	6	0	1	1	1	1	0	1	2	13	**72.22**
L 15	6	0	1	1	1	1	2	2	0	14	**77.78**
L 16	5	2	1	0	1	0	2	2	2	15	**83.33**
L 17	6	1	1	1	1	1	0	0	0	11	**61.11**
L 18	6	2	1	1	1	0	0	0	2	13	**72.22**
L 19	6	0	0	1	1	0	2	2	0	12	**66.67**
L 20	6	2	0	0	1	1	0	0	2	12	**66.67**
L 21	6	1	1	1	1	1	0	2	0	13	**72.22**
L 22	5	0	1	1	0	1	2	1	2	13	**72.22**

L 23	6	2	1	1	1	1	2	2	0	16	**88.89**
L 24	6	1	1	1	1	1	2	2	1	16	**88.89**
L 25	6	2	1	1	1	0	2	2	2	17	**94.44**
L 26	6	1	0	1	1	0	2	2	0	13	**72.22**
L 27	6	0	1	1	1	1	0	1	0	11	**61.11**
L 28	5	1	1	1	1	1	2	1	2	15	**83.33**
L 29	6	2	1	1	1	1	2	2	0	16	**88.89**
L 30	6	2	1	1	1	0	2	2	2	17	**94.44**
L 31	6	2	1	1	1	1	0	0	0	12	**66.67**
L 32	6	2	1	1	1	0	2	2	0	15	**83.33**
L 33	6	2	1	1	1	0	0	2	0	13	**72.22**
L 34	6	2	1	1	1	0	2	0	0	13	**72.22**
L 35	6	2	1	1	1	1	2	2	0	16	**88.89**
MINIMUM	4	0	0	0	0	0	0	0	0	10	55.56
MAXIMUM	6	2	1	1	1	1	2	2	2	17	94.44
AVERAGE	5.77	1.37	0.89	0.91	0.91	0.63	1.14	1.23	0.89	13.74	76.35

Post-test results

Learner	PostPI_6	PostLS_2	PostB_1	PostU_1	PostI_1	PostC_1	PostH_2	PostF_2	PostPB_2	Total	Percentage
L1	6	2	1	1	1	1	2	1	2	17	**94.44**
L 2	6	2	1	1	1	1	2	2	2	18	**100.00**
L 3	6	1	1	1	1	1	1	2	2	16	**88.89**
L 4	6	2	1	1	1	1	2	2	2	18	**100.00**
L 5	6	2	1	1	0	1	2	2	2	17	**94.44**
L 6	6	2	1	1	1	1	1	2	2	17	**94.44**
L 7	6	2	1	1	1	1	2	2	2	18	**100.00**
L 8	6	1	1	1	1	1	2	2	2	17	**94.44**
L 9	6	2	1	1	1	1	2	1	2	17	**94.44**
L 10	6	2	1	1	1	1	2	2	2	18	**100.00**
L 11	6	2	1	1	1	1	2	2	2	18	**100.00**
L 12	6	2	1	1	1	1	2	2	2	18	**100.00**
L 13	6	2	1	1	1	1	1	2	0	15	**83.33**
L 14	6	2	1	1	1	1	2	1	2	17	**94.44**
L 15	6	1	1	1	1	1	2	2	2	17	**94.44**
L 16	6	2	1	1	1	1	2	2	2	18	**100.00**
L 17	6	2	1	1	1	1	2	2	0	16	**88.89**
L 18	6	2	1	1	1	1	2	1	2	17	**94.44**
L 19	6	1	1	1	1	1	2	2	2	17	**94.44**
L 20	6	2	1	1	1	1	1	0	2	15	**83.33**
L 21	6	1	1	1	1	1	0	2	0	13	**72.22**
L 22	6	0	1	1	1	1	2	1	2	15	**83.33**

L 23	6	2	1	1	1	1	2	2	2	18	**100.00**
L 24	6	1	1	1	1	1	2	2	2	17	**94.44**
L 25	6	0	1	1	1	1	2	2	2	16	**88.89**
L 26	6	1	1	1	1	1	2	2	2	17	**94.44**
L 27	6	2	1	1	1	1	2	1	0	15	**83.33**
L 28	6	2	1	1	1	1	2	1	2	17	**94.44**
L 29	6	2	1	1	1	1	2	2	2	18	**100.00**
L 30	6	1	1	1	1	1	2	2	0	15	**83.33**
L 31	6	2	1	1	1	1	1	2	2	17	**94.44**
L 32	6	2	1	1	1	1	2	2	2	18	**100.00**
L 33	6	2	1	1	1	1	2	2	2	18	**100.00**
L 34	6	2	1	1	1	1	2	1	2	17	**94.44**
L 35	6	2	1	1	1	1	2	2	2	18	**100.00**
MINIMUM	6	0	1	1	0	1	0	0	0	13	72.22
MAXIMUM	6	2	1	1	1	1	2	2	2	18	100.00
AVERAGE	6.00	1.66	1.00	1.00	0.97	1.00	1.80	1.71	1.71	16.86	93.65

APPENDIX I- DUT (DS1)

PRE &

POST QUESTIONNAIRE

DURBAN UNIVERSITY of TECHNOLOGY

School of Information and Communication Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Dear participant

Thank you for taking part in this study. The study seeks to investigate the impact of the isiZulu language in the learning of Information Technology (IT) courses i.e. Development Software (DS). The main focus is to assist Previously, Technologically, Disadvantaged (PTD), English second language learners to understand IT better.

The results of the study will determine whether isiZulu should be included in the learning of IT or not.

Please fill out the details below:

Student Number: _____

Surname: _____

Name: _____

Kindly tick **ONLY ONE** of the available options

1. Choose the best way that can help you to understand IT courses better.

A.	English only	
B.	IsiZulu only	
C.	English first, then isiZulu	
D.	IsiZulu first, then English	
E.	Mix / Dual parallel (English and isiZulu)	

/Thank you/

APPENDIX- J

DUT (DS1) TEST

DURBAN UNIVERSITY of TECHNOLOGY

Development Software 1 Test

Student No: _____

Surname: _____

Name: _____

Question One

1.1 Write a module (Calc_Interest) that will calculate Interest Amount, given the following variables in the main program: Payment_Period, Current_Balance and Interest. The Payment_Period is calculated over 3 months at 10% or 6 months at 15%. For each Payment_Period, the Interest is calculated by multiplying Current_Balance by the percentage.

_____

_____

_____

_____

_____

_____

_____

_____

Question Two

2.1 Given the following program:

```
1.  Procedure ReadMarks (T1, T2, T3)
2.      Write ("Enter test 1 mark:')
3.      Test_1 = ReadLine()
4.      Write ("Enter test 2 mark:')
5.      Test_2 = ReadLine()
6.      Write ("Enter test 3 mark:')
```

```
7.          Test_3 = ReadLine
8.      End Sub
9.      Function Calc_Average (T1, T2, T3)
10.         Average = T1 + T2 + T3 / 3
11.     Return Average
12.     End Sub
13.     Procédure Write_Results (results)
14.         Results = Average 14.
15.     End Sub
16      Sub Main
17.         Dim T1, T2, T3 as integer
18.         Dim Average, Results as Double
19.         ReadMarks(T1,T2,T3)
20.         Calc_Average
21.         Write(results)
22.     End Sub
```

2.2.1 Identify which is the function

_____

2.2.2 Identify which is the procedure

_____

2.2.3 For each module, is there any parameters?

2.2.4 For each function, what is the returned result?

_____

2.2.5 For each procedure what is the returned result?

2.2.6 In the main program, identify where modules are called.

_____

_____

/End/