

ONLINE MULTILINGUAL GLOSSARIES IN TEACHING AND LEARNING HIGHER
EDUCATION: A FEASIBILITY STUDY

by

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ABSTRACT

The key objective of this multiple case study was to determine the impact of the online multilingual glossaries tool on the academic experience and success of first year students. The study further seeks to advance the use of African languages in academia, science, and technology, among other fields. The use of English only as the medium of instruction often creates a barrier to learning for students for whom English is not a first language and this often has a direct impact on whether they succeed or fail academically. To address this language challenge, the Cape Peninsula University of Technology developed an online multilingual glossaries tool to assist students learn and understand key concepts and complex terms in prescribed programmes through their first languages, which are primarily isiXhosa and Afrikaans. The study was conducted with first year students enrolled in the Applied Law Unit, Nursing, and Horticultural Science departments. A mixed method approach that includes Yin's (1984) multiple case study design was used to evaluate and analyse the data to find patterns in how students from various fields of study interact with languages and the online multilingual glossaries tool. Data was collected through questionnaires, quasi-experiments, and focus group discussions with students, as well as semi-structured interviews with lecturers. Based on students' experiences with the platform and the improved experiment scores following the use of online multilingual glossaries, the study findings show a positive academic experience and improved concept knowledge among first year students. It is advisable to extend the development of subject-specific multilingual glossaries to other academic programs and, eventually, make them a fundamental component of all courses and disciplines at CPUT. Furthermore, the usage of the current CPUT online multilingual glossaries in the classroom should definitely be investigated and tested further.

Keywords: multilingual glossaries, hypermedia, key concepts, access, success.

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CHAPTER 1

INTRODUCTION AND RESEARCH BACKGROUND

1.1 Introduction

There is considerable evidence in higher education nationally and internationally about the value of using home languages as languages of learning and teaching, or in support of language development in English in different disciplinary contexts (Madiba, 2010). The European Centre for Modern Languages (ECML) is a Council of Europe institution that supports language education by promoting the use of diverse languages in the classroom. (Newby et al., 2008:84). Home language support, such as the educational use of indigenous South African languages in higher education, has been shown to have benefits for students' conceptual development (Hibbert & Van der Walt, 2014). The usage of African languages in professional or technical contexts where terminology is complex has even greater benefits for speakers of African languages (Wyrley-Birch, 2006). In this research study, the focus is on the impact of online multilingual glossaries (IsiXhosa, Afrikaans and English terms) in support of English additional language 1st year students enrolled in Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts subjects.

The creation and development of subject-specific multilingual glossaries at Cape Peninsula University of Technology (CPUT) started in 2012. In fact, this process is still ongoing as more glossaries or terminology lists keep being added. The online multilingual glossaries platform (mlg.cput.ac.za) was developed as a tool to house all multilingual glossaries and make these easily accessible to students.

This resource was developed mainly to provide academic support to first year students, especially enrolled within courses with at-risk subjects (subjects with a consistent low pass rate). Among the initially identified subjects were Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts.

CPUT has a total of nine campuses (Bellville main campus, District Six, Granger Bay, Mowbray, Wellington, Groote Schuur Hospital: service point, Roeland Street, Media City Building, and Tygerberg Hospital: service point). The Foundation of Nursing Practice subject was offered at the Nursing Department, which was based on one of CPUT's satellite campuses located in Athlone (which has since relocated to the main

campus, Bellville). The subject deals with basic concepts on the Foundation of Nursing Practice. The Horticulture 1 and Plant Material Studies subjects were taught within the Horticultural Sciences Department in the Faculty of Applied Sciences, Bellville campus, and covers concepts from Horticulture 1 and Plant Material Studies; while the Law of Contracts subject was taught within the Unit for Applied Law, in the Faculty of Business and Management Sciences, also located at the Bellville campus. The Law of Contracts subject makes considerable use of basic law concepts, which are crucial in the subject, necessitating the need of useful multilingual glossaries.

Within the complete institutional cohort of career-focused course subjects, which offer more than 70 different subjects, there is no particular order of priority for the chosen subjects to be included in this research study. However, as mentioned previously, these were some of the subjects with identified as being at-risk. Additionally, the choice to use these subjects for this study was influenced by the cultural background of students enrolled in these subjects, the actual practice activities involved in each subject and the keen interest of departments to be part of such a research study.

The development of multilingual glossaries, with the aim of preserving and intellectualising indigenous languages for use in different education disciplines has become a fast-growing practice in South African universities over the last ten years (Paxton, 2009). Some of the universities, to name a few, that have developed multilingual glossaries include University of Cape Town within a corpus-based multilingual glossaries project; the University of KwaZulu Natal with their SANTED multilingualism project; UNISA, in their multilingual terminology and glossary development project; and Nelson Mandela Metropolitan University, in their multilingualism in education project. The online multilingual glossary platform at CPU, developed by the Centre for Innovative Educational Technology in collaboration with the Language Unit, Fundani CHED (Centre for Higher Education Development), is aimed at providing pedagogical support to students. Data from this research study is used to determine the impact of the online multilingual glossaries platform on the academic experience of first year students studying Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts subjects.

This study embraces the development and use of African languages for academic success and the promotion of language and technology for teaching and learning in

the digital age which must be leveraged for successful teaching. The literature therefore includes different aspects of language and technology in relation to the enhancement of academic access and success.

1.2 Background to the research

In South Africa, for many years, tertiary institutions have used English and Afrikaans as mediums of instructions (Paxton, 2009). This is despite the fact that the country has eleven official languages (Afrikaans, English, isiNdebele, isiXhosa, isiZulu, Sesotho sa Leboa, Sesotho, Setswana, SiSwati, Tshivenda, Xitsonga), to which the state guarantees equal status (Brand South Africa, 2009 - 2016).

According to research conducted by the Ministry of Education in 2000 on the linguistic diversity of students enrolled in public universities and technikons, 50% of total student enrolments indicated an indigenous African language or another language as their home language. The evidence also suggested that most universities and Technikons (now known as Universities of Technology) use English as the sole medium of instruction (Ministry of Education, 2002). The use of English as the sole medium of instruction in higher education is a major barrier to learning for a majority of students whose first language is not English, and consequently they struggle with understanding their course and academic content. The use of English as the only language of teaching and learning is a challenge since students must grasp their course content in order to pass and complete their qualification, as well as acquire a professional identity after completing their studies..

From the Ministry of Education (2002) research it was revealed that South African universities have not developed and made available study materials such as textbooks in any of the South African official languages other than English and Afrikaans. It is within this context that, in 2002, the Department of Education issued the Language Policy for Higher Education which required institutions to include in their rolling plans the strategies they had put in place to “promote multilingualism” and ensure the development of all official languages as academic and scientific languages (Ministry of Education, 2002). With the Language Policy in Higher Education promoting the use of indigenous in higher education, a number of language development initiatives were conceptualised. Among those was the development of multilingual glossaries/terminologies. CPUT like many of its counterparts created online

multilingual glossaries in efforts to enhance teaching and learning official programmes offered at the institution. Additionally, to promote multilingualism and contribute to the quest of preserving the previously marginalised languages.

The online multilingual glossary were developed through collecting complex concepts from subjects across academic disciplines, translating these concepts from English into IsiXhosa and Afrikaans, the three regional languages spoken in the Western Cape where CPUT is located. The initial sourcing of terms was followed by a verification workshop of the translated concepts to ensure that these are within context. As previously stated, the three languages were chosen due to proximity in the Western Cape and other manpower restrictions. It is acknowledged that there are speakers of other languages at the university (Arabic, French, German, IsiNdebele, Isizulu, other African languages, other European languages, Portuguese, Sepedi, Sesotho sa Leboa (North Sotho), Sesotho (South Sotho), Setswana, Siswati, Spanish, Tshivenda, and Xitsonga) (CPUT Higher Education Data Analyzer (HEDA) system, 2022).

The institution's language policy also makes a commitment to promoting other South African and international languages in support of the institution's wider community (CPUT Language Policy, 2008). The aims of these online multilingual glossaries are: (a) to provide academic support to students whose first language is not English; (b) to assist in teaching and learning of key concepts in prescribed programmes; and (c) the development of discipline-specific materials (African language terminologies).

1.3 Research problem

Even though, CPUT has developed an online multilingual glossaries tool which is integrated with hypermedia of verified subject-specific multilingual content, the impact of the CPUT online multilingual glossaries platform on student academic experience and success has not been studied.

1.3.1 Research questions

The research questions formulated in response to the above research problem are:

Main question

What is the impact of the online multilingual glossaries platform on the academic experience of the students selected for this study at CPUT?

Sub-questions

1. What are the students' attitudes towards the online multilingual glossaries?
 - 1.1 What are the students' perceptions of the online multilingual glossaries?
2. How do students use the online multilingual glossaries for purposes of meaning making?
3. To what extent does the students' level of understanding of particular concepts impact on their learning?

1.4 Aims of the study

The aim of this study is to evaluate the impact of the online multilingual glossaries platform on the students' academic experience and success, particularly in mastering key concepts in their programmes.

This study draws on Cummins's theoretical model of Basic Interpersonal Communicative Skills (BICS) and Cognitive Academic Language Proficiency (CALP) (Cummins, 1991, 2008, 2009). The conceptual distinction between BICS and CALP highlights the "misconceptions about the nature of language proficiency that had been contributing directly to the conception of academic failure among bilingual students" (Cummins, 1999:3). Cummins attests that English language proficiency alone is not enough for second language (L2)-students to compete in English with their first language (L1) counterparts in an academic setting (Cummins, 1984b, 2008). In addition, L2 and L1 students' previous schooling, academic knowledge, and literacy skills contribute to their unequal footing when applying themselves in an English academic world (Cummins, 1984b; Baker, 1993). This also suggests that students arrive at institutions with unequal competencies in other important areas, such as computer literacy, multimedia skills, and social skills. For the purposes of this study, the contribution of the CPUT online multilingual glossaries to BICS has been the provision of audio recordings of the translated concepts for Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts subjects. The inclusion of audio has deepened the students' voice or opinions about the level of simplicity of the language that is integrated during the glossary verification step. The

translation of terminologies is meant to assist L2 students in comprehending the terminology and content taught in the discipline (thus, enhancing CALP).

1.5 Objectives of the study

In order to achieve the aim of this study, the following objectives were pursued:

- To determine students' attitudes towards, or perceptions of, the online multilingual glossaries.
- To establish how students use the online multilingual glossaries for meaning making purposes.
- To determine the extent to which students' level of understanding of particular concepts impacts their learning.

1.6 Research methodology

The current study investigated the impact of the online multilingual glossaries platform on the students' academic experience and success at CPUT. Epistemologically, the position of this study is to establish how students use the ability of understanding concepts in their mother tongue to learn, understand, and apply English academic concepts, especially as second language speakers of English. To accurately capture and document these experiences, this research utilised a multiple case study strategy.

Multiple case studies distinguish themselves from, for example, surveying many people about something, instead of one person; or increasing the range of subjects within an experiment. Instead, the utilisation of multiple cases has to be considered similar to the repetition of an experiment or study. The conclusions from one case have to be compared and contrasted with the consequences from the different case(s) (Bengtsson, 1999). The study focused on three different academic subjects. Each subject, together with its unit of analysis (UoA), is a different case because of the unique field-specific practices.

1.7 Significance of the study

It is envisioned that this study will provide academic support to students whose first language is not English. This is done by providing assistance in the teaching and learning of key concepts in academic programmes through the use of the online multilingual glossaries. In addition, this research contributes to the development of

discipline-specific African language terminologies used by students as they engage with the glossaries. Ultimately, the researcher hopes that this study will make a significant contribution in filling the research gaps regarding the development of scientific terms for different fields of study using African languages. Furthermore, this research seeks to benefit higher education and education generally with a particular focus on technology integration into the curriculum, particularly through the digitisation and preserving of scientific indigenous concepts and terminologies.

1.8 Ethical considerations

Prior to the commencement of this research study, ethical clearance was obtained from the Cape Peninsula University of Technology's Ethics Committee. Documents that were approved included: information consent letters and a questionnaire for the students participating in the research study; and the structured interview questions for the subject lecturers involved. Official permission was also obtained from the heads of departments of Nursing (in the Faculty of Health and Wellness Sciences), Horticultural Sciences (in the Faculty of Applied Sciences), and the Unit for Applied Law (in the Faculty of Business and Management Sciences). The ethical clearance letter and samples of all other supporting documents mentioned can be found in Appendix A.

1.9 Structure of the thesis

Chapter 1 sets the scene for this research, introducing and providing details on the background of the study.

In Chapter 2, an overview of literature relevant to the exploration of the study is provided. Multilingualism practices in South African higher education are looked into. There is also a focus on strategies of harvesting, compiling and developing multilingual terminologies. The next section from there is centred on the development of multilingual online resources for teaching and learning. This chapter also extends to the theoretical framework that guides this study. A conceptual framework by Jim Cummins (1991, 2008, 2009), Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP), highlights the transfer of academic skills that occurs through the first language (L1) to the second language (L2).

Chapter 3 explains the research design, with the qualitative and quantitative research methodologies used in this study, as well as data collection techniques and the validation process.

Chapter 4 provides an explanation of the data analysis techniques of this research. The process of analysing both the qualitative and quantitative data sets is discussed. Thereafter, a summary of all findings from the data analysis in this study is presented in suitable forms based on the type of data findings.

In Chapter 5 gives a summary and interpretation of findings of the qualitative and quantitative studies. This is presented to answer the research question of this study. The research recommendations are also discussed.

Chapter 6, provides a conclusion, aligning the study to the impact of the CPUT online multilingual glossaries platform on the academic experience of students who participated in this study.

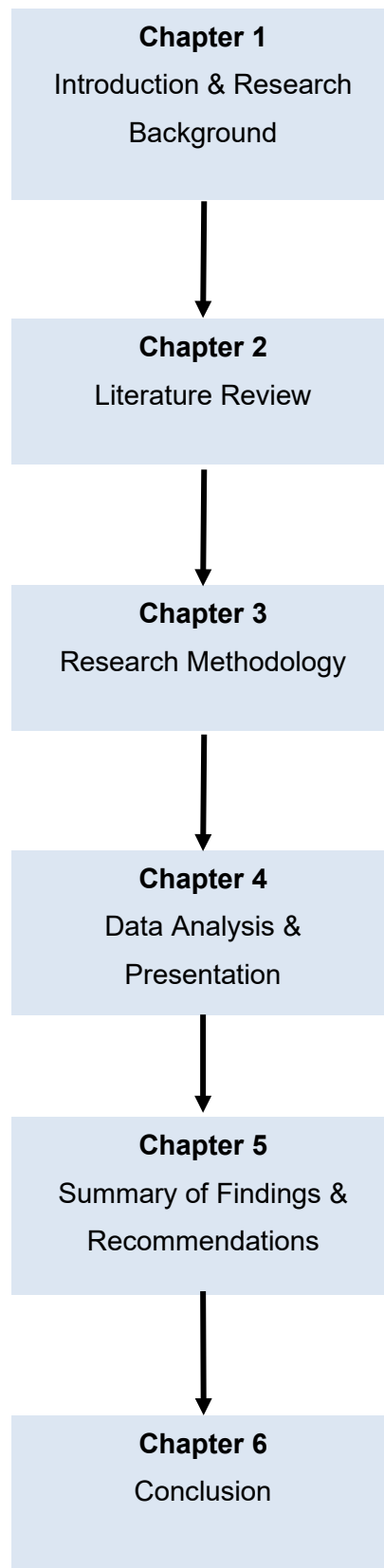


Figure 1: Structure of this thesis

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

Literature on the use of subject-specific multilingual glossaries for academic success suggests that this has become a fast-growing practice in South African universities in recent years (Paxton, 2009). In South Africa, tertiary institutions have used English and Afrikaans only as mediums of instruction, despite the fact that the state guarantees equal status for all eleven official languages of the country, the above went on from the early years of South African education until 1997 when The Language in Education Policy Act (Act 27 of 1996) was adopted. One of the paradigms within which this policy operates is the right to choose the language of learning and teaching, a right which is vested in the individual. This right has, however, to be exercised within the overall framework of the obligation on the education system to promote multilingualism (Olivier, 2009). Associated concepts in ATLAS.ti a statistics software were used to group the data codes (also known as categories). To construct "smart groupings," of these codes, additional analysis and thought were applied to the "grouped codes" (also known as themes). Among the themes that show up in this chapter are the following: multilingualism practices and policies in South African higher education; the harvesting and extraction of concepts and terminologies in the fields of Horticultural Sciences, Applied Law and Nursing; the compilation and development of multilingual glossaries; the role of translation and verification for meaning making; and the development of multilingual online resources for teaching and learning based on a traditional information systems methodology (Structured System Analysis and Design Method) (Dixit & Kumar, 2007).

2.2 Background

According to the South African Language Policy for Higher Education (Ministry of Education, 2002), higher education should take steps to ensure that a multilingual environment is immediately developed and that all South African languages are progressed as academic or scientific languages. At the same time, such institution should ensure that current languages of instruction (namely English and Afrikaans) do

not act as obstacles to access education (access to knowledge) and achievement of qualifications (Ministry of Education, 2002).

There is considerable evidence about the value of using home languages as languages of learning, or as languages of support and intervention in different disciplinary contexts (Madiba, 2010) where English remains a dominant language. Students, especially at higher education levels, should also be able to use their mother tongue to gain deeper understanding of academic concepts within their courses. Using only the English language as the medium of instruction often creates a barrier to learning for students whose first language is not English (Madiba, 2010:227). The Ministry of Education (2003) report further confirms that mostly students struggle to read and understand instructions in academic English in their course materials and also in their course assessments.

In response to the Language Policy in Higher Education (2002), Cape Peninsula University of Technology (CPUT) has developed an online multilingual glossaries tool as one of the multilingual teaching and learning tools aimed at promoting multilingualism and developing African languages in the official programmes offered by the institution. The development of the online multilingual glossaries at CPUT started in 2012 with the aim of translating 'difficult to understand', discipline-specific terms from English into isiXhosa and Afrikaans, which are official and dominant languages of the Western Cape. In the universities with multilingual glossaries, different techniques and models are used to provide students with access to these glossaries for academic support. A model that is a fast-growing trend in some of the South African universities is the development of subject-specific multilingual glossaries (Paxton, 2009). However, in most of the universities, multilingual glossaries are distributed and shared manually, and in hard copy formats (Nkomo & Madiba, 2011).

CPUT developed and launched an online hypermedia multilingual glossaries tool in 2016 to assist in teaching and learning of key concepts and difficult terms in prescribed programmes, using student's home languages (specifically Afrikaans and isiXhosa) (Ralarala et al., 2016).

2.3 Multilingualism practices and policies in higher education in South Africa

The majority of the South African population is multilingual. Approximately 80% of South Africans speak an African language (Alexander, 2018). Thus, it makes sense that South African universities should become more multilingual now than before. The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996), which recognises 11 languages as the official languages at national level in South Africa, made provision for a law that laid the foundation for the implementation of multilingualism in South African universities (Madiba, 2013).

The Higher Education Act of 1997 (South Africa DoE, 1997) authorized the various Ministers of Education to call for language policies and plans to be put in place at all educational institutions. In October 2011, the then Minister of Higher Education in South Africa, Mr Blade Nzimande, referred to this Act in his address to the African Languages Steering Committee. In his speech, Nzimande reaffirmed the expectation that all South African higher education institutions develop a language policy and language plan to implement multilingualism, and various universities have been assigned the task of developing and promoting the language of their region (Wildsmith, 2011).

The year 1994 symbolises the dawn of independence in South Africa. At that time, the government of South Africa expected previous inequalities to be rectified in different sectors including higher education and, as a result, the language policy included the development of indigenous languages to a stage where they can be used as mediums of instruction alongside English (Wildsmith-Cromantry, 2008).

However, Tait (2007:34) believes that South African higher education is still characterised by language policies that give strong preference to English, as evident in functions such as lecturing, study material, tests and examinations, administration, recruitment of staff and students, research, research publications and conferences. According to Roodt (2001:2), the prominent role of English is supported by the great availability of English material, the language medium of the Internet and it being the choice of many African speakers, including parents and students. In the context of higher education, Madiba (2013:386) also attributes the dominance of English and Afrikaans to the apartheid era, where English and Afrikaans were declared by law to

be the only official languages that were permitted for the purpose of teaching and learning at tertiary institutions.

Ngcobo and Nomdebevana (2010:187) confirm that the South African Language Policy grants the country's eleven languages an official and equal status, but also indicate that only two languages (English and Afrikaans) are regarded as more developed, while the other nine, which are all indigenous languages, are seen as not adequately advanced to survive in the modern-day globalised society. However, Section 29.2 of Act 108 of 1996 states that, under the new constitution, "everyone has the right to receive education in the official language or languages of their choice in public educational institutions where that education is reasonably practicable" (Madiba, 2013; 386).

Ndamba expressed the view that many proficient and successful linguists, as well as bilinguals, believe that mother tongue is used during primary years of education and provides the best introduction to literacy that ultimately becomes useful in the acquisition of English as a second language (Ndamba, 2008). However, only as recently as 2005, South African universities have started introducing multilingual initiatives in various models, including multilingual glossaries, in most cases intended to help with the understanding of academic concepts.

The South African-Norwegian Tertiary Development Programme is one of the multilingual policies and practices at South African institutions (SANTED), a multilingualism project aimed at developing isiZulu terminology in Nursing and Midwifery studies at the School of Nursing at the University of KwaZulu Natal (Engelbrecht et al., 2010). University of Cape Town's language policy states that language and literature departments that teach South African languages ought to play significant awareness and promotional roles in multilingual teaching and learning programmes and the development of resources such as multilingual glossaries to support non-mother tongue English students (UCT Language Policy, 2003). Currently, at CPUT, the online multilingual glossaries project is an interdisciplinary and cross-faculty initiative aimed at developing subject-specific scientific concepts and terminologies in African languages.

According to CPU's Language Policy, the university encourages the development of isiXhosa and Afrikaans to varied degrees as academic languages as needed. The departments are encouraged to investigate the possibility of including assessments in isiXhosa and Afrikaans (i.e., assignments and examination or test question papers). Furthermore, support services like eLearning, counselling, writing centers, libraries, student, and general administrative services are to be available and provided, in students' preferred languages (CPU Language Policy, 2008).

Despite the existing multilingual models, only one university in the country seems to have advanced in efforts to include an indigenous language, isiZulu, as mandatory subject at the level of academic teaching and learning. The University of KwaZulu Natal, officially introduced isiZulu as an official subject for all first year undergraduate students from 2014. There are further examples of related practices at other South African universities. The University of Stellenbosch has developed isiXhosa glossaries. The University of North-West has introduced a process of simultaneous translation during lectures, along with text editing programmes for African languages. The Nelson Mandela University now offers short courses in translation studies with a focus on all official South African languages. The University of Limpopo now offers a Bachelor of Arts in multilingualism (BA Contemporary English and Multilingual Studies – BA CEMS) (Mashatole & Makgoba, 2022. Rhodes University has a short course for isiXhosa called *Ulwimi Nentlalo* (Language and Society) (Kaschula, 2013).

Discipline-specific multilingual terminology development has also been a feature at several South African universities. For example, Rhodes University and the University of the Western Cape (UWC) have been developing terminology lists for specialized study fields in isiXhosa for disciplines such as mathematics and science, computer science, pharmacy, education and political philosophy (Dalvit, 2010; Maseko 2011). At the University of Cape Town, corpus-based multilingual glossaries have also been developed for English as additional language for students to help them overcome conceptual difficulties in accessing discipline content (Madiba, 2010).

At the University of KwaZulu Natal (UKZN), a dual-medium approach is being implemented for Foundation Phase student teachers who are being trained in literacy and life skills in the mother tongue (isiZulu) (Mbatha, 2009). Webb (2009) further reports that, at the University of the North-West, three programmes in the Faculty of Education are being taught in Tswana; and, at Wits University, an isiZulu method

course is offered. Finally, Plüddemann, Nomlomo and Jabe (2010) report on the use of isiXhosa in an Action Research module offered as part of a continuing teacher development programme. All these projects have noted an increased level of academic performance in their students when they were offered the opportunity to use their home languages for learning and assessment (Wildsmith, 2013).

Stellenbosch University developed and made available a multilingual glossary for law students in 2006. This glossary was aimed at first year students, particularly isiXhosa speaking students, to assist them in learning the legal concepts in their mother tongue. This project resulted into four chapters of multilingual terminologies for law that were published and made accessible to students: family law, customary law, criminal law and an introduction to law. The Latin terms were presented untranslated, while the English terms and definitions were translated into isiXhosa and Afrikaans (Sibula, 2006).

A collaboration between the University of South Africa's Department of Criminal and Procedural Law was established to address the need for clear communication in the theoretical and applied disciplines of human activity, such as the legal profession, Procedural Law and Northwest University's Research Unit for Language and Literature in the South African Context created a multilingual glossary of legal terms. Terminologists and subject specialists were focused on the provision of unambiguous source and target-language terms for well-defined concepts. In order to achieve this goal the legal terminology was produced in two languages, i.e., Afrikaans and Northern Sotho (Alberts & Mollema, 2013).

Alberts and Mollema (2013) believe that the indigenous community would benefit from the bilingual legal and political terminology in a diverse range of situations. , i.e., enable users to cope in their first languages when, for instance, facing court procedures as either the accused, as a legal representative or as a court interpreter. A practical and key method to achieving engaging and continuous education, Albert and Mollema (2013) urge court interpreters to continue to improve their spoken and written knowledge of their working languages, including specialised terminology.

2.4 Harvesting of concepts and terminologies

Harvesting of concepts and terminologies within the context of developing multilingual glossaries can be defined as the process extracting the suitable and important terms that make up the fundamentals of an academic subject or course texts. This section will highlight some research methods of extracting terminologies for the purpose of developing multilingual glossaries specific to particular projects and the reasoning behind the extraction methods.

The SANTED multilingualism project used manuals and WordSmith software (a set of tools used in corpus linguistics to look for patterns in a language) to extract frequently used terms from academic material. With the aid of fourth-year (Bachelor of Nursing) students, the project manager extracts important terminology from several nursing and midwifery academic areas. The subject expert in nursing determined and verified the key terms in the field. Reading text, recognizing things, and extracting meanings from the prescribed text or external sources, such as dictionaries, are all the steps that are taken in the manual term extraction process. These terms and their definitions were entered into terminology lists and properly cited. In the School of Nursing it was believed that offering the chosen glossary terms in isiZulu may be the solution to the communication difficulties that students are faced with in their classroom activities as well as in experiential learning in the community and hospitals (Engelbrecht, et al. 2010:251).

The Statistics glossary developed at the University of Cape Town, is based on a small corpus generated by size, text type, publication status, text origin, text constitution, authorship, external and internal criteria. The corpus, which consists of instructional literature including textbooks, course manuals, and tutorials, comprises roughly 118000 running words. The WordSmith tools were utilized for concordance and phrase extraction. A total of 3689 terms were retrieved from the corpus, and 472 of them were chosen based on their frequency, degree of difficulty, and conceptual richness. According to (Madiba, 2010: 229) final word lists were extracted with the assistance of the statistics lecturer.

In a different study, the spoken Zulu and spoken Xhosa corpora were mined for roughly 20,000 tokens each for the study. The Role of Spoken Language Corpora in the Intellectualization of Indigenous Languages in South Africa. In order to observe the

type of intellectualization already occurring in spoken languages, a spoken corpus-linguistics approach was chosen as the most suitable methodology (Ngcobo & Nomdebevana, 2010:193).

2.5 The compilation of multilingual glossaries

The process of compiling multilingual glossaries is the actual development of scientific terminologies from English academic texts to equivalent terminologies in African languages. This compilation process usually involves a number of stakeholders who are specialists in different areas related to a specific subject or field of practice. Personnel who are involved in the compilation process to ensure representation of their different skills in developing equivalent African language scientific terms include language specialists, subject specialists, traditionalists, modernist language specialists, linguist terminologist, industry/field specialists, students (at different study levels), tutors, translators, linguists, and terminologists.

Madiba believes that a corpus-based glossary is more effective in learning concepts because it provides contextual examples, multiple exposures to the term and examples of different meanings in different contexts (Madiba, 2010:237). A term from a corpus-based glossary is used in different contexts or concordances which introduce additional definitions or uses of the term (Madiba, 2010:238).

A different method is used in the 'The Role of Spoken Language Corpora in the Intellectualisation of Indigenous Languages in South Africa' research project, where the first task of corpus development is the compilation of a body of texts called a corpus. Ncgobo and Nomdebevana (2010:192) confirm that, in South Africa, spoken corpora for the official indigenous languages are being developed by the University of South Africa (UNISA) as an open-ended corpus project. They also mentioned that WordSmith tools were used to isolate each token that is used in the corpus, borrowed words and concepts were extracted from the list of tokens, and their frequency of use in transcribed spoken isiZulu and spoken isiXhosa corpora was noted (Ncgobo & Nomdebevana, 2010:194).

At the University of Limpopo, existing material in Sesotho sa Leboa (i.e., newspaper articles, films and essays on multilingualism) are used as part of a responsive and flexible curriculum and terminology development. Students are also involved in several

activities, including the translation of existing English material and the creation of original material in Sesotho sa Leboa (Ramani & Joseph, 2006).

In other research conducted at Limpopo University, Ramani highlights an intervention that went beyond terminology development. In this study, students developed concepts using their mother tongue. This empowered them to master academic skills, for example predicting, hypothesising, testing and legitimising their position (Ramani et al., 2007).

2.6 The role of translation and verification for meaning making

Jim Cummins's theoretical framework distinguishes between two types of language proficiency: basic interpersonal skills (BICS) and cognitive-academic language proficiency (CALP). This framework is later referred to as conversational and academic language proficiency. (Cummins, 1991). The framework confirms that English language proficiency alone is not sufficient for L2 English students to compete in English with their L1 counterparts in academic settings. (Cummins, 1984, 2008).

Transference refers to the process of borrowing a source language item (English) into the target language (in this case IsiZulu) without changing it and thus the source language item becomes a loan item in the target language. Transliteration in the SANTED multilingualism project meant that the equivalent terminology was morphologically and phonologically adapted to the target language (IsiZulu), both methods were used frequently in this project (Engelbrecht et al., 2010:265).

Madiba (2010:240) believes that students must have both the definition and contextual information about words, as well as repeated exposure and opportunities to learn and review them. Once students understand the meaning of concepts in different contexts, it becomes easier for them to generate their own definitions and the translation equivalents in their first language (Madiba, 2010:240). The quote by Madiba highlights the importance of providing students with comprehensive and repeated exposure to new vocabulary in order for them to fully understand and effectively use new words. Madiba's approach emphasizes the importance of not only learning definitions but also understanding the context in which words are used. By providing students with opportunities to explore new concepts in various contexts, they are better equipped to create their own definitions and translate them into their first language.

This approach is essential for fostering strong language skills in students, and it is a testament to the expertise and dedication of scholars like Madiba who strive to create effective learning environments to promote the importance of language learning. However, Lafon (2012) makes the point that learners' prior knowledge of their own languages often consists of local urban varieties which include a number of other languages, as well as the home language. This may raise the question of standardising the African languages. Currently, the 'standard' variety selected for educational purposes has been developed by Language Boards, resulting in a 'deep' variety that is unfamiliar to the learners or students, which poses a challenge for learning and teaching through the medium of an African language (Wildsmith, 2013).

2.7 Terminology development

According to Dalvit (2010), the key issues in developing terminology in African languages is to strike a balance between the use of borrowings from European languages (mainly English) and the development of new terms.

Ngcobo and Nomdebevana (2010:186) confirm that language corpora have, globally, become extremely important database resources for a variety of linguistic, socioeconomic, cultural, educational and other developments (such as in machine translation and human-machine interactions). They also advise that the intellectualisation and reformation of indigenous languages in South Africa will require (among other things) the use of modern tactics, including technology, and taking cognizance of the fact that language adapts to a changing world as it is used in specialised domains of language use. They argue that teaching through the medium of indigenous languages of South Africa in schools and in tertiary education will necessitate the introduction of many technical terms into these languages to express the concepts that were not originally available in those South African indigenous languages. However, terms extracted from spoken corpora can eventually be standardized and used in learning and teaching material (Ngcobo & Nomdebevana, 2010:190).

The University of South Africa (UNISA), in their multilingual terminology and glossary development project, has worked on an open-ended corpus project to develop spoken corpora for the official indigenous languages. WordSmith tools were used to isolate each token that is used in the corpus; and borrowed words and concepts were

extracted from the list of tokens, and their regular use in transliterated, spoken isiZulu, as well as in spoken isiXhosa corpora, was noted (Ncgobo & Nomdebevana, 2010: 194). Additionally, the Stellenbosch University's multilingual glossaries project was developed by their language centre in association with an internal department of African languages in 2006. These glossaries are accessible on an online system called Mobilex (Van der Merwe, 2017).

At CPUT, the online multilingual glossaries project is an interdisciplinary and cross-faculty initiative aimed at developing subject-specific scientific concepts and terminologies in African languages to provide academic support to students for whom English and Afrikaans is not a first language. CPUT's language policy states that the institution supports the process of developing varying degrees of isiXhosa and Afrikaans languages where required, as academic languages. The development of materials such as glossaries in isiXhosa and Afrikaans, encouraged departments to explore the possible provision of assessments in isiXhosa and Afrikaans, i.e., assignments and examination or test question papers, and support services such as eLearning, counselling, writing centres, library, student, and general administrative services to be available and provided, in students' preferred language (CPUT Language Policy, 2008).

2.8 The Development of multilingual online resources for teaching and learning

Information and Communication Technologies (ICTs) have been extensively used in the development of multilingual glossaries for higher education. Here are some examples: Computer-assisted translation (CAT) tools are used for the translation of terms and phrases into different languages. They can store and manage glossaries, translation memories, and terminology databases, making it easier to produce consistent and accurate translations (Bowker & Pearson, 2002). Babylon, EuroTermBank, and GlossaryLinks are examples of online glossary management systems, which are web-based systems that allow for the creation, management, and sharing of multilingual glossaries (Ariza & Errasti, 2015).

Electronic dictionaries and terminology databases are software applications that provide definitions, explanations, and translations of terms and phrases in different languages. Examples include Termium Plus, IATE, and Linguee (Meyer, 2011).

Corpus analysis software is used for the analysis of enormous amounts of text, allowing the identification of relevant terms and phrases in their context. Examples include WordSmith Tools, AntConc, and Sketch Engine (McEnery & Hardie, 2012).

Software that translates text automatically across languages is known as machine translation (MT). They can be helpful for producing preliminary translations of terms and phrases even though they are not always exact. Examples include DeepL, Microsoft Translator, and Google Translate (Hutchins & Somers, 1992). ICTs such as CAT tools, online glossary management systems, electronic dictionaries and terminology databases, corpus analysis software, and machine translation software have all been used in the development of multilingual glossaries for higher education.

A number of South African higher education institutions have undertaken projects to develop subject-specific glossaries, terminology lists, and texts in various African languages through translation (Wildsmith, 2013). Most multilingual glossaries in different universities have been developed over a number of years but they have only recently been put on different online platforms (Nkomo & Madiba, 2011). Producing online glossaries is a viable strategy as we are living in a digital age where all communications and information resources are digitized for unlimited and easy access. This is also important for the modern survival of the recording of the developed African language scientific terminology (Ngcobo & Nomdebevana, 2010:191-193) and curating African languages. Some of the universities have integrated their multilingual glossaries within their institution's learner management systems (to ensure seamless learning in one environment) or in online learning environments.

The SANTED multilingualism project identified terms in English and their Zulu equivalent, as well as posted definitions in both languages on a Moodle (an online learner management system) (Rice, 2006) in the form of a glossary. Nursing and midwifery lecturers, together with students at various levels of their study programmes, will be introduced to the website in a workshop (Engelbrecht et al., 2010:263).

The corpus-based multilingual glossaries project at UCT has its Statistics multilingual glossary uploaded to the Multilingualism Education Project (MEP) Online Learning Environment on *Vula* (soon to be *Amathuba in 2023*), which is UCT's Online Environment, developed by Sakai (a learning management system). This online learning environment provides English as an Additional Language (EAL) with easy

access for students to multilingual and other online courses (Madiba, 2010:242).

Ngcobo and Nomdebevana (2010) found that, although there have been efforts aimed at developing indigenous languages in South Africa, these initiatives have overlooked terminology created during interaction in spoken language corpora. This leads to the development of terms that are totally foreign to speakers of indigenous languages as they are created by a few isolated individuals. Hence, Mwansoko (2004) further argues that language elaboration, or language intellectualization, is the process through which new terminology is coined and the language is modernized for use in specialized communication. At our verification workshops at CPUT, students contribute to this process and make their voices heard and as part of the language development, as well as the verification process. Figure 2 depicts the procedure that was adopted by CPUT for the process of developing its online multilingual glossaries:

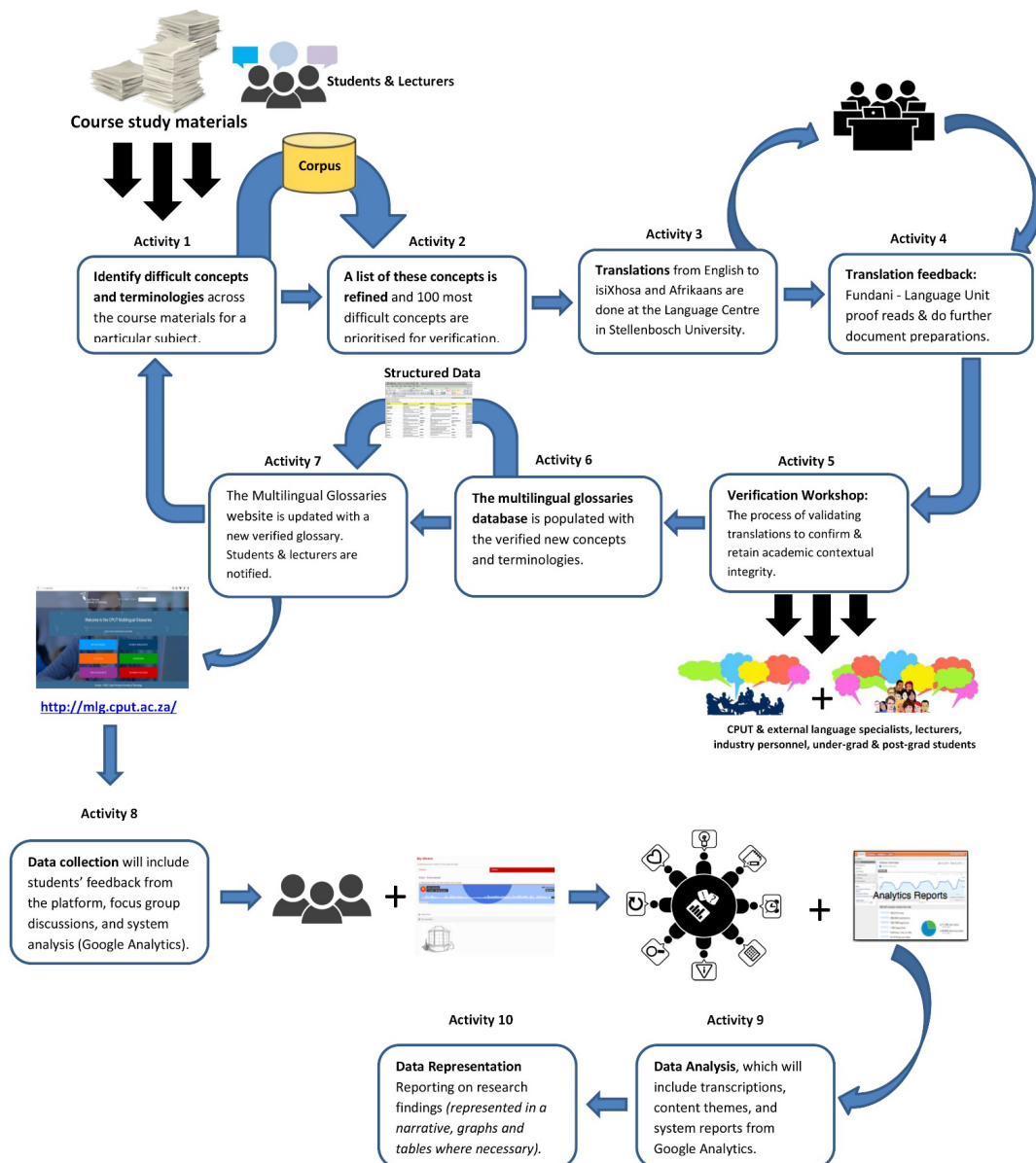


Figure 2: Procedure for concept and terminology identification, collection and verification adopted at CPUT

Table 1 below shows a sample of verified terminologies from the Law of Contracts multilingual glossary:

Table 1: Sample of terminologies verified for the subject: Law of Contracts

English	Afrikaans	isiXhosa
<p>Natural person</p> <p>Natural persons are a category of legal subjects that refers to all human beings.</p>	<p>Natuurlike person</p> <p>Natuurlike persone is 'n kategorie regspersone wat na alle mense verwys.</p>	<p>Abantu</p> <p>Nguye nawuphi na umntu.</p>
<p>Juristic person</p> <p>Juristic persons are a category of legal subjects that refers to associations and bodies other than human beings, e.g., companies.</p>	<p>Juridiese person</p> <p>Juridiese persone is 'n kategorie regspersone wat verwys na verenigings en liggame buiten mense, bv. Maatskappye.</p>	<p>Amaqumrhu, iimanyano nemibutho</p> <p>Ngawo nawaphi na amaqumrhu, iimanyano nemibutho, enamagunya ewanikwa ngumthetho, hayi umntu.</p>
<p>Reciprocal contract</p> <p>A contract that gives rise to rights and obligations on the part of both parties to the contract, in other words, both parties to the contract are simultaneous debtors and creditors.</p>	<p>Wedersydse kontrak</p> <p>'n Kontrak wat aanleiding gee tot regte en verpligtinge vir beide partye tot die kontrak, met ander woorde beide partye tot die kontrak is gelyktydig debiteure en krediteure.</p>	<p>Isivumelwano esifana macala</p> <p>Isivumelwano esinika ukuphakama kumalungelo kunye neemfanelo kwindawo yamaqela omabini kwisivumelwano, ngamanye amazwi, amaqela omabini kwisivumelwano bangabantu abanamatyala ngexesha elinye.</p>

English	Afrikaans	isiXhosa
English	Afrikaans	isiXhosa
<p>Voidable contract</p> <p>An agreement that came into existence validly, but may be challenged due to some “fault” that occurred at the time of the conclusion of the contract.</p>	<p>Vernietigbare kontrak</p> <p>’n Ooreenkoms wat op ’n geldige wyse gesluit is, maar bevraagteken kan word as gevolg van een of ander “fout” wat voorgekom het ten tyde van die sluiting van die kontrak.</p>	<p>Isivumelwano esiphuthileyo</p> <p>Isivumelwano esibekho ngokusemthethweni, nokuba, ngenxa “yesiphene” esithile esenzeka ngeloxesha lokuququnjelwa kwesivumelwano, inokuba nomcela mngeni.</p>
<p>Parties to a contract</p> <p>These are persons who incur rights and/or obligations in terms of the contract.</p>	<p>Partye tot ’n kontrak</p> <p>Dit isdié persone wat regte of verpligtinge ingevolge die kontrak aangaan</p>	<p>Amaqela kwisivumelwano</p> <p>Aba ngabo bantu abazenzela amalungelo kunye okanye iimfanelo ngokwesivumelwano.</p>

The design method for the online platform was based on a traditional information systems approach for web development, which included Waterfall, Structures System Analysis and Design Method (SSADM), Prototyping, Rapid Application Development (RAD), and Incremental Prototyping (Howcroft & Carroll, 2000).

When the platform was built, an incremental prototyping design method was employed to emphasize the following strategies: (a) the development of the most important features of the system were done to completion first, then the rest of the features were developed later in the project; (b) project implementation time was accelerated; (c) the incremental approach for developing the platform proved to be useful in the dynamic world of the web; (d) the website gradually grew, both in size and functionality. This approach accommodates the changing nature of web technologies.

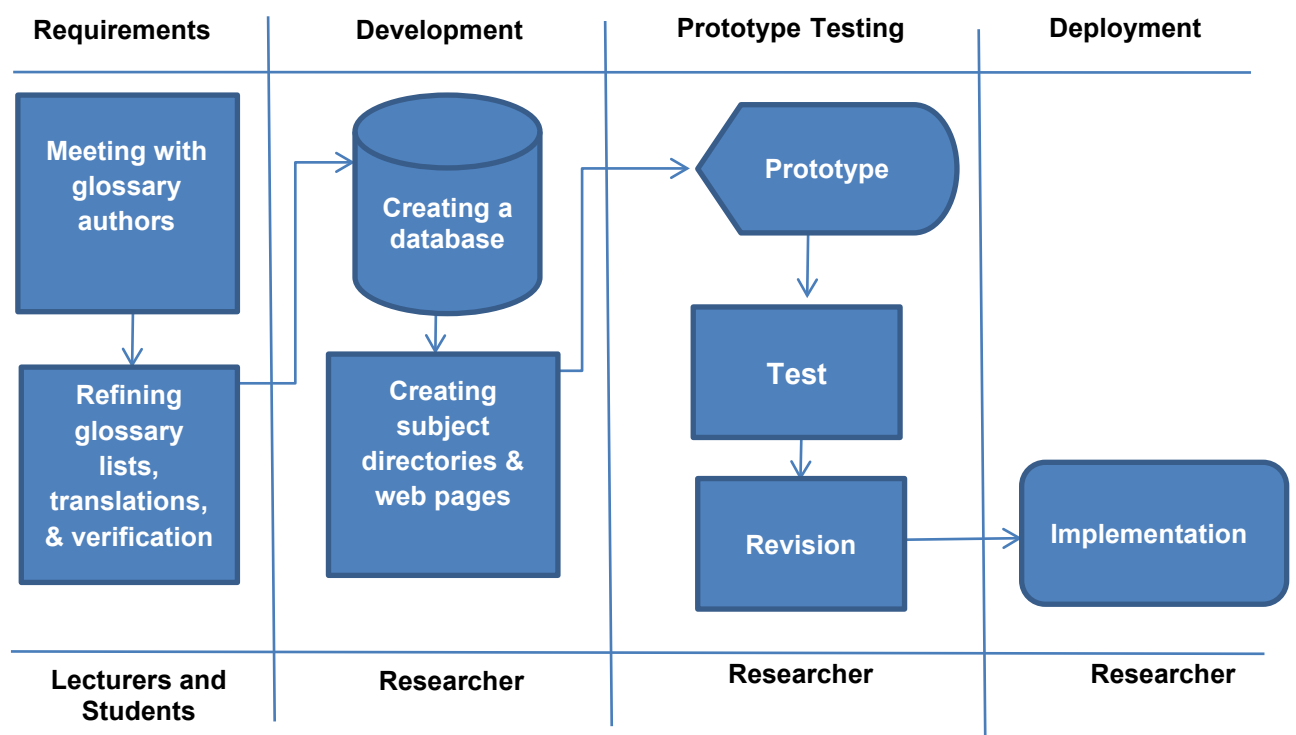


Figure 3: Workflow diagram for prototype development (Manashe et al., 2020: 163)

Initially, the following key features were identified as critical components of the online multilingual glossaries platform: (1) user registration section for first time access; (2) login section for registered users; (3) an indexed list of concepts within a subject-specific glossary; (3) a search area for locating specific concepts; (4) audio recordings of the glossaries (in isiXhosa and Afrikaans); (5) image and illustration integration capabilities; (6) a suggestions section for user feedback; and (7) a member feedback section for group discussions. At a later stage the login function was removed to allow the platform to be inclusive and open to the users as much as possible.

The online multilingual glossary platform

The CPUT online multilingual glossaries are accessible through the following website address: <http://mlg/cput/ac.za>. The website home page displays a list of faculties; and within the faculties there is a list of subjects with concepts and terminologies that have been translated and verified for Afrikaans and IsiXhosa (the multilingual glossaries). The website also provides two possible ways of accessing the multilingual glossaries: (1) An indexed list showing an “A” to “Z” listing of letters that represent all available glossary concepts beginning with each letter in a specific glossary of a chosen subject; and (2) a search box where a user can type a concept or term they wish to search for.

If the searched for word is in the database, the relevant translations in Afrikaans and IsiXhosa are returned; otherwise an appropriate message for the missing concept that is being searched for is displayed.

Additionally, users are able to switch between the Afrikaans and IsiXhosa translations as desired, while the English definition is still displayed for Afrikaans and IsiXhosa at the same time. Furthermore, the platform has provision for suggestions or feedback where users can comment on the translated definitions, suggest new terminologies or concepts to be part of a specific multilingual glossary. With this feature, a user is also able to give general comments and suggestions on the content or the platform usability for their maximum benefit. All comments go to a dedicated, multilingual glossaries email inbox which is monitored by the researcher, and comments, requests and suggestions are used to effect appropriate action to improve the platform (Manashe et al., 2020:166)

The CPUT online multilingual glossaries website is shown in Figures 4 to 7 here:

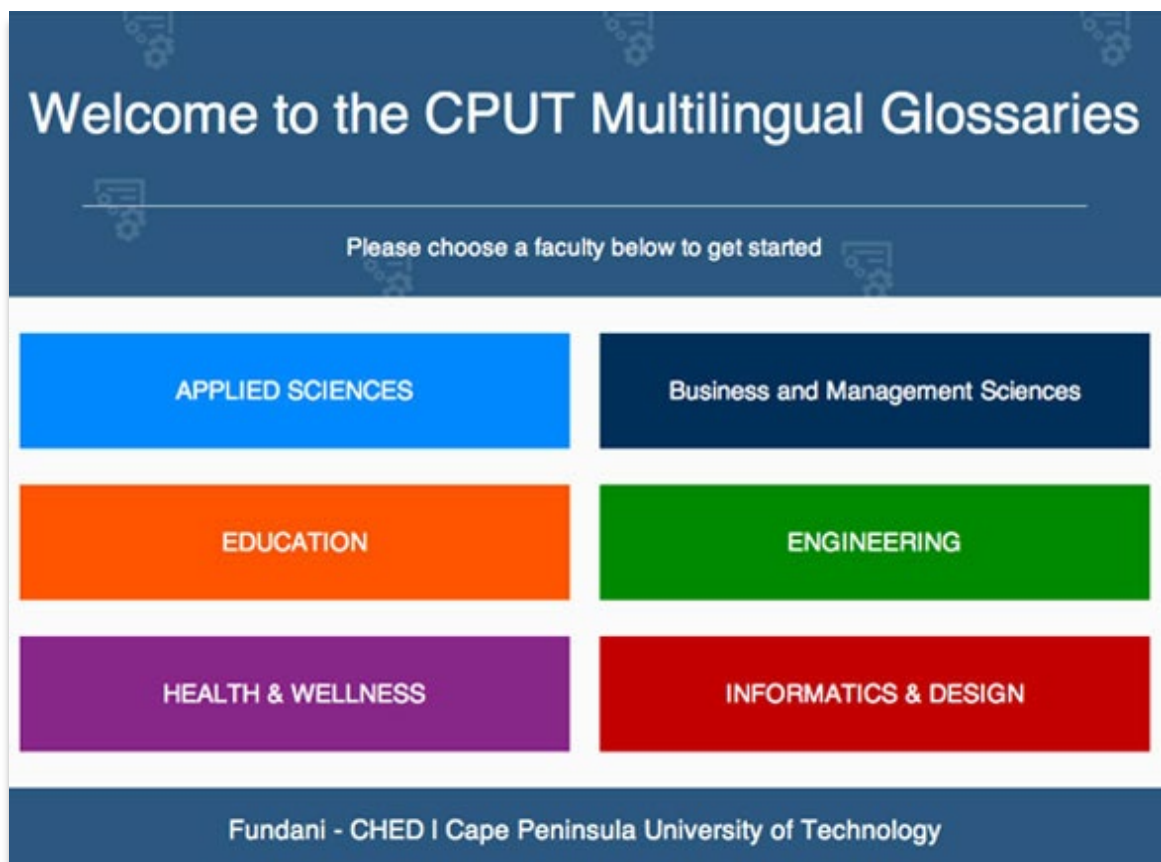


Figure 4: Screenshot of CPUT multilingual glossaries website

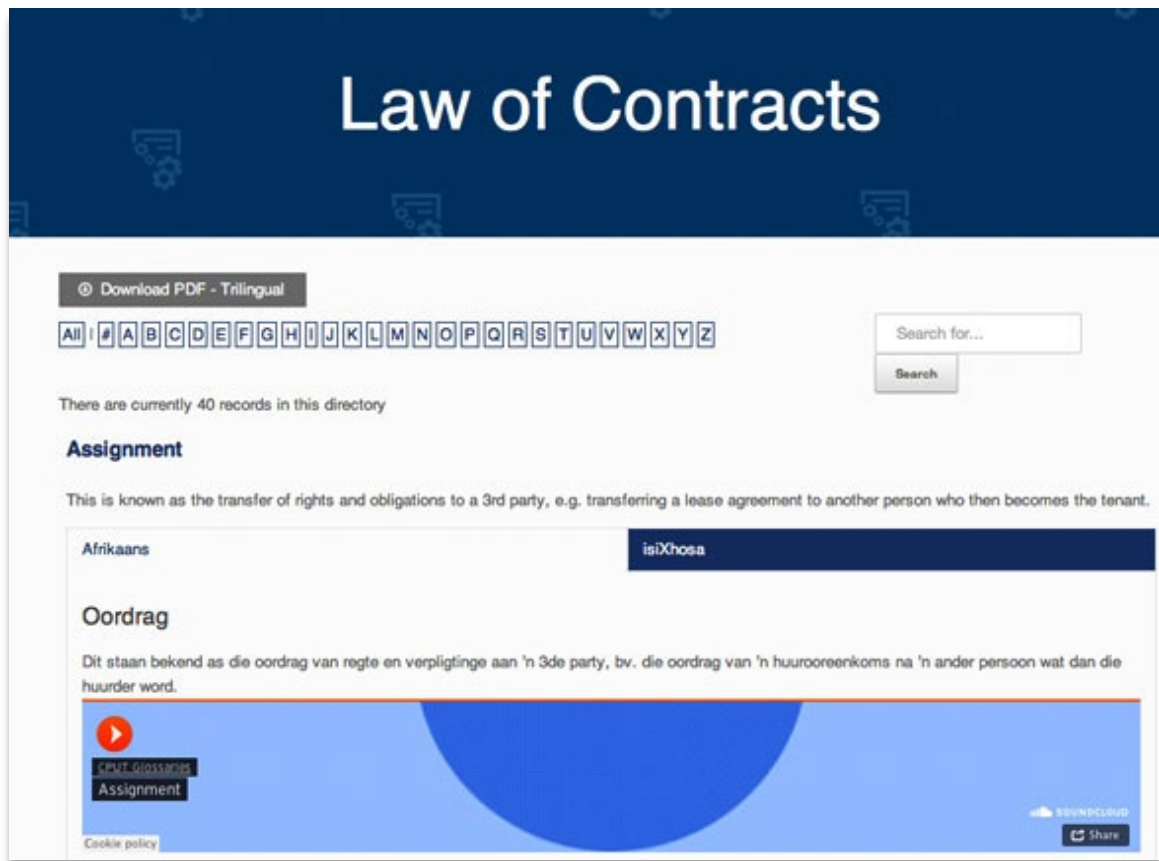


Figure 5: Screenshot of Law of Contracts multilingual glossaries

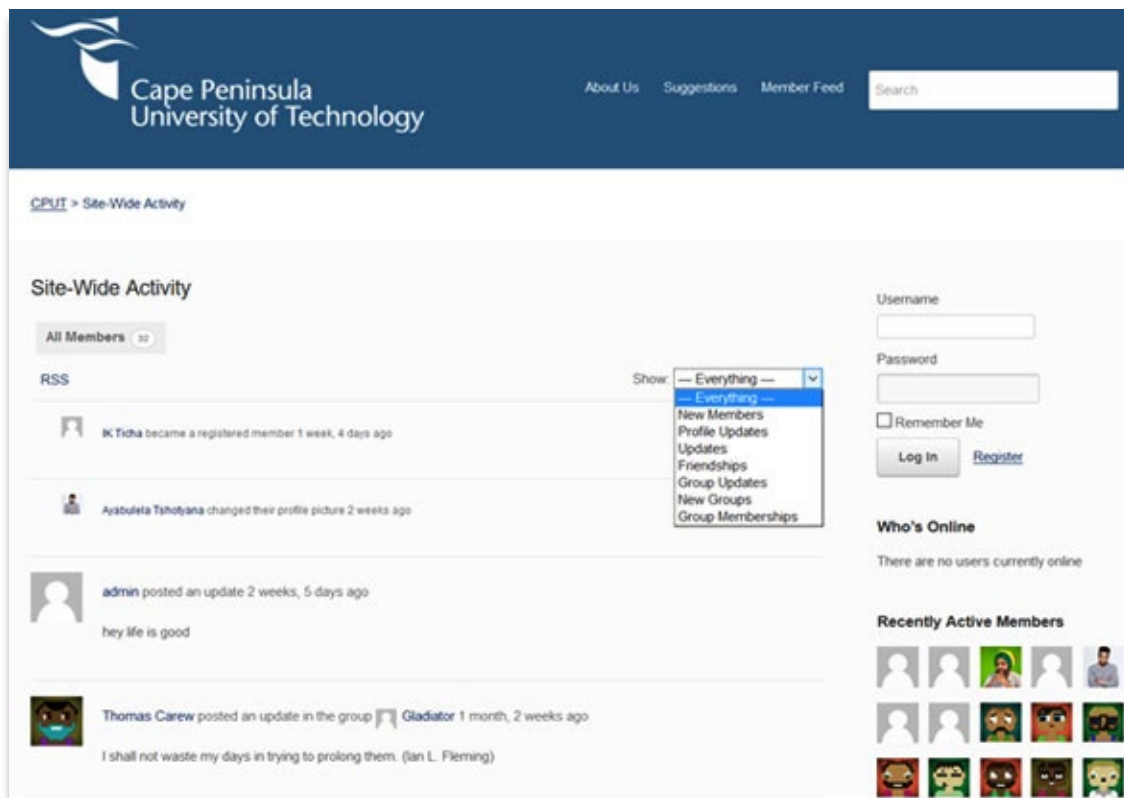


Figure 6: Screenshot of the member feed page

Submit Your Suggestions

Fill in the form below as accurate as possible

Full Name(s) *
Student Nr. *
Subject *
Applied Science - Biotechnology
Old Phrase *
Revised (new) Phrase *
Verification
Please enter any two digits *
Example: 12
Submit

Figure 7: Screenshot of the suggestions page

2.9 Summary of literature review

The dominance of English in Higher Education can prevent students who are not proficient in English from studying in a meaningful way (Dalvit et al., 2005). Dalvit et al. mention that the gap between those who have access to quality education in South Africa and those who do not has widened in the last ten years (Chisholm, 2004). Two crucial factors involved in the entrenchment of inequality are the language used for instruction, and access to information and communication technologies (ICTs) (Chisholm, 2004; Dalvit et al., 2005).

The South African government policies acknowledge the importance of ICT for economic and social development. They also recognise that the education system has a crucial role to play in bringing the advantages offered by new technologies to members of previously disadvantaged communities Department of Education (DoE, 2001) and the Department of Communication and Digital Technologies (DCDT, 2001). In addition, a recent document by the Department of Education (DoE, 2005) emphasises the need to promote technological discourse in the African languages, acknowledging the potential role of English as a "gatekeeper" to the study of ICT and its use in education (Dalvit et al., 2005).

In South Africa, the medium of instruction is often English, regardless of the mother tongues used by the students. African students with low levels of English proficiency struggle to cope with the use of English as the sole Language of learning and Teaching (LoLT) (Dalvit et al., 2009). Despite the fact that, from a sociolinguistic and educational point of view, mother tongue education is the ideal (Van der Walt, 2003), English is generally preferred as the medium of instruction in schools and higher education institutions, especially by African-language-speaking parents (Nkabinde, 1997; Laufer, 2000; Webb & Kembo-Sure, 2000; Murray, 2002; Webb, 2002; Mutasa, 2003; Nyembe, 2003; Van der Walt, 2003; Ferguson, 2006; Nomlomo, 2006; Setati, 2008).

The Pan South African Language Board (PanSALB) (2000), in its 2000 'Guidelines for language planning and policy development' report (PanSALB, 2000), recommends multilingual education in English and the African languages to be the most appropriate solution for South Africa (Dalvit et al., 2005). Following South Africa's multilingual language policy in 1994, African language terminologists, who are all first language speakers of the various official languages, were employed to document African language terminology in a variety of subject fields (Alberts, 2010:610). This resulted in the publication of technical glossaries sponsored by the Department of Arts and Culture (DAC) (Alberts, 1999, 2010).

Nkomo and Madiba (2011) envision the use of multilingual glossaries to help students relate to their learning of the key concepts in the various subject fields. Dalvit et al. (2005) found that the use of a web-based resources, such as online multilingual dictionaries and glossaries, can contribute to solving some of the teaching and learning problems mentioned previously. A further supporting statement from Engelbrecht et al. (2010) is that, when multilingual terminology lists are uploaded online for feedback and further consultation, this helps to address the language intellectualisation and the different objectives for terminology development in diverse disciplines (Wildsmith, 2011).

Fernandez-Parra (2008) explains that the extraction and development of terminology, translation of documents, and dissemination of glossaries using electronic methods, should be cost effective. Studies on recent attempts to use an African language as an additional medium of instruction at tertiary level have mentioned some prominent

problems, one being the lack of resources in the African languages and the difficulties of using only one African language in a multilingual context (see Lockett, 1995; Ramani & Joseph, 2002). ICTs can make a contribution in this respect. Unlike traditional textbooks and dictionaries, multilingual material in electronic format is cheap to produce and distribute (Dalvit et al., 2005).

A growing number of documents and websites in South Africa's indigenous languages are available on the Web (De Schryver, 2002). De Schryver (2003) notes that these documents, such as online dictionaries, are quite successful in terms of the number of users (Dalvit et al., 2005).

Jonker's research reports that multilingual, subject-specific terminological interventions can play a significant role in improving Extended Degree Programme (EDP) students' pass rate in their mainstream subjects, as well as their experience of success. This is increasingly possible when these interventions form an integral part of the mainstream curriculum (Jonker, 2016).

Madiba's (2010) findings confirm that corpus-based multilingual glossaries contribute to English Second Language (ESL) student's understanding of complex statistical concepts in their different contexts. He also found that definitions based on concordances are more helpful than de-contextualised dictionary definitions. He cautioned, though, that mere memorization of definitions will not result in a deep understanding of a concept. To develop a deep understanding of a concept, students must understand the meaning of the terms in different contexts. Direct vocabulary instruction and explicit concept teaching that make provision for learning in a student's mother-tongue can create new zones of learning possibilities (Madiba, 2010:243)

Paxton's findings illustrated the importance for students to use a range of languages and discourses to negotiate meaning of unfamiliar terms.

The impact of CPUT's online multilingual glossaries platform on student academic experience has not been studied. This research focuses on evaluating the online multilingual glossaries platform to establish its impact on the students' academic experiences. The academic experience should include, but not be limited to, learning in the students' native language and comprehending and mastering complex academic concepts.

2.10 Theoretical framework

This section relays the significant role played by Jim Cummins' conceptual framework, namely Basic Interpersonal Communication Skills and Cognitive Academic Language Proficiency (BICS and CALP) (Cummins, 1984), in the teaching and learning of academic concepts. Cognitive semiotics is also drawn upon for insight into the linguistic meaning making experience of students who have been using multilingual glossaries at CPUT (Herman, 2003a).

2.11 Conceptual framework

Cummins conceptual framework relates language proficiency in the mother tongue (L1) and a second language (L2) to academic performance. Cummins (1979, 1981a, 2008) distinguishes between two types of English language proficiency: Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP). This conceptual distinction highlights the "misconceptions about the nature of language proficiency that has been contributing directly to the conception of academic failure among bilingual students" (Cummins, 1999). Cummins (1979, 1981a, 2008) created these terms to sensitise educators regarding the delays in learning using a second language and challenges L2 students face as they attempt to work at the same academic literacy levels as their English L1 counterparts in the required academic language. The rationale of the current study was to afford first year students of Horticultural Sciences, Law of Contracts, and Foundation of Nursing better conceptual access and understanding of the language of their disciplines. The details of the conceptual framework and its relevance to this research are explained in the following discussion.

2.12 Basic Interpersonal Communication Skills (BICS)

BICS refers to the social and conversational language used for oral communication. This language proficiency offers several clues to listeners and the language is context-embedded. It takes L2 students approximately two years to acquire BICS, depending on the richness of the acquisitional linguistic context. The L2 students would then be able to comprehend context-embedded social language by observing non-verbal behaviour, visual images, concrete objects, and different contextual cues which exist at the current time of observation and others' reactions to these, along with the use of voice cues such as phrasing, intonation, and stress. The L2 student can then ask for statements to be repeated and clarified.

2.13 Cognitive Academic Language Proficiency (CALP)

CALP refers to students' potential to understand and express concepts and thoughts successfully in an academic setting, using both oral and written modes. It takes five to seven years for L2-students to become competent in the specific academic language. They acquire CALP more slowly because there are no non-verbal cues, face-to-face interactions are limited, academic language is often abstract, there is demand for high literacy skills (textbooks are written beyond the language proficiency of the students), and L2 students lack the necessary cultural/linguistic knowledge to fully comprehend the academic language.

The original BICS/CALP distinction evolved with the inception of discrete language skills. It refers to the learning of rule-governed aspects of a language (including phonology, grammar, and spelling) (Cummins, 2000). Discrete language skills can be developed in isolation from academic language proficiency and result in students who can read English texts fluently but with limited understanding (Cummins et al., 2007).

Cummins (1983) validates this conceptual BICS/CALP distinction by drawing on the Biber's (1986) research which offered him much evidence gathered from a wide variety of oral and written communicative situations. This distinction was not proposed as an overall theory of language proficiency but rather as a conceptual distinction to guide policy and practice. A number of scholars delivered critique on this distinction, taking the constructs out of their original dialogical or discursive contexts. Baker (1993) views Biber's (1986) distinction of oral and written communicative situations as vague, value-laden, overgeneralized and misused to stereotype English language learners. Other scholars, cited in Street and Hornberger (2008:77), depict the same distinction of oral and written communicative situations by Biber (1986) as "oversimplified, reflective of an 'autonomous' rather than an 'ideological notion of literacy, an artefact of 'test-wiseness' and a 'deficit theory' that attributes bilingual students' academic difficulties to their 'low CALP'". Cummins (1984b, 2000) addressed these viewpoints by providing a theoretical framework which inserts the CALP language proficiency concept within a larger theory of Common Underlying Proficiency (CUP).

Cummins's CUP model of bilingualism can be pictorially illustrated in the form of two icebergs (see Figure 8). The two icebergs, depicting two different languages, are

separate above the surface. Beneath the surface, however, the icebergs are merged, implying that the two languages functions collaboratively by using the same central processing system.

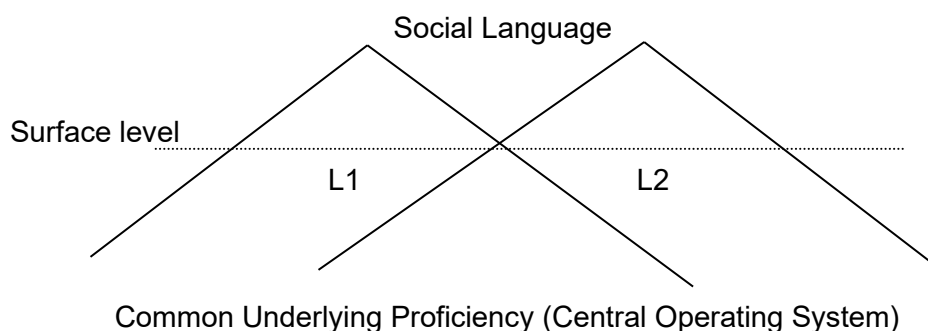


Figure 8: Common Underlying Proficiency Model (Central Operating System) (Cummins, 2005)

2.14 Cognitive semiotics

Cognitive semiotics is the study of meaning-making, applying methods and theories from semiotics, linguistics, psychology, cognitive sciences, computational modelling, anthropology, philosophy and other sciences (Brandt, 2011).

This study also draws on insight from the cognitive semiotics framework to provide another perspective. The rationale for using the cognitive semiotics perspective is to sensitise our teaching and learning perspective that meaning is an all-encompassing activity, i.e., cognitive semiotics employs linguistics and other meaning-making categories of physical, social and symbolic classifications. Nordquist (2018) explains that semiotics, then, is the theory and study of signs and symbols, especially as elements of language or other systems of communication.

2.15 Relevance of BICS and CALP to this study

Cummins suggests that learners need a minimum level of linguistic and conceptual knowledge in their first language to develop a second language successfully. Once this knowledge is firmly established in a first language, the students can draw on this learning when working in an additional language. As a result, continued support for conceptual and linguistic development in a student's first language provides a solid basis for development in an additional language. This is directly connected to the benefit of using BICS and CALP in this study.

2.16 The importance of technology in enhancing BICS and CALP

Cummins's conceptual framework attests that English language proficiency alone is not enough for L2-students to compete in English with their L1 counterparts in an academic setting (Cummins, 1984b, 2008). In addition, L2 and L1 students' previous schooling, academic knowledge, and literacy skills contribute to their unequal footing when applying themselves in an English academic world (Cummins, 1984b; Baker, 1993). Limited English Proficiency (LEP) students' language skills are often informally assessed on the basis of upon their ability to comprehend and respond to conversational language (Cummins, 1981a, 1981b, 2000, 2003, 2008). Based on students' proficiency in conversational situations, assumptions are drawn about their competence to engage with more complex concepts through the medium of English in academic, context-reduced, literacy contexts in mainstream classrooms (Cummins, 1980, 1981b).

The clear distinction between BICS and CALP is clear when dealing with the above issues which affect the academic trajectories of L2 students (Cummins, 1980, 1981b, 1984, 1999). One should therefore consider that, although BICS and CALP are distinguishable, they do not necessarily develop separately. Students create their conceptual framework (world knowledge) from social interactions, mainly in their homes, where they develop their critical literacy (CALP) skills and deeper understanding of concepts from discussions about conceptual issues.

Student's conceptual frameworks (also indicates that students come to institutions already enriched with competences, like their computer literacy, multimedia and social skills. In the case of this study, the CPUT online multilingual glossaries contributed to BICS through the provision of audio recordings of the translated concepts for Foundation of Nursing Practice, Horticultural Sciences, and Law of Contracts subjects, aimed to enhance the students' contributions to the multilingual glossaries which include simplifying the language used in the glossaries for better understanding of concepts and terminology. Students' inputs are incorporated during the verification stage of the glossary development. The translated terminologies are also aimed at helping L2 students with the understanding of the terminologies and content taught in the discipline (thus, enhancing CALP).

Cummins's work suggests that learners are most successful at understanding content and language, not only when they are stimulated cognitively, but also when they are provided with the appropriate context and language support.

2.17 Conclusion

This chapter has reviewed existing literature dealing with the development of multilingual glossaries. The literature covers the phenomenon of multilingual glossaries and their impact on academic success. The multilingual glossary is a teaching tool intended to make teaching and learning easier and to help students understand academic discourse which is complicated and challenging for most people who speak English as a second language. The procedures used for gathering concepts and terminologies, creating multilingual resources, and distributing the contents of multilingual glossaries, are also covered in this literature.

Despite many universities having developed multilingual glossaries for their institutions, many of these glossaries are available via static webpages only. Most of the multilingual glossaries out there are not on a dynamic platform: they do not have audio recordings of terminology, nor relevant illustrations for their multilingual glossaries content; instead, their multilingual glossaries content is presented as static web pages, or downloadable PDFs and HTML tables in the university's learner management systems. Jonker (2016) explains that these universities include the University of KwaZulu-Natal (UKZN), Durban University of Technology (DUT), Rhodes University (RU) and the University of Cape Town (UCT). UKZN, in collaboration with DUT, developed an English-isiZulu terminology list and glossaries in the following disciplines: Education, Nursing (midwifery), Psychology, and Dental Assisting. UCT developed multilingual (English-isiXhosa-Afrikaans) glossaries in Statistics, Mathematics, Economics and Law. RU developed various multilingual glossaries, including bilingual (English-isiXhosa) glossaries in Computer Science and Political Philosophy (Mawonga et al., 2014:66-67).

This current work is meant to focus on the promotion of multilingualism at CPUT, to create positive academic experiences in concept mastery among enrolled students and, ultimately, to contribute to the fast-paced growth of African language resources for academic use. In line with this, the next chapter will elaborate on the methodology that was used to carry out this research study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This is a mixed methods research study of the variables related to the impact of the CPUT online multilingual glossaries platform and the experience and success of first year students in learning and mastering academic concepts using African languages.

In this study, the researcher uses a mixed methods research approach. Mixed methods research combines elements of qualitative and quantitative research to answer the research question.

Research methodology refers to the systematic process of investigating a particular subject or problem. The concept is interpreted differently by various scholars, but it generally involves the analysis of assumptions, principles, and procedures related to a specific inquiry. According to Schwardt (2007), methodology is the process of following an inquiry, which requires the identification and selection of appropriate research methods, data collection techniques, and data analysis procedures. Methodology, therefore, describes and explains the kinds of problems that are worth investigating, and it helps researchers to develop a clear plan of action for conducting their studies. Creswell and Tashakkori (2007) and Tashakkori and Teddlie (2003) also emphasize the importance of methodology in research. They suggest that the research methodology should be carefully chosen to ensure that the research questions are answered effectively and accurately. The methodology should be aligned with the research goals and objectives, and it should take into account the practical and ethical considerations of the research process.

Research methodology involves a systematic and rigorous approach to investigating a particular subject or problem. It requires the identification and selection of appropriate research methods, data collection techniques, and data analysis procedures. The methodology should be carefully chosen to align with the research goals and objectives and should consider the practical and ethical considerations of the research process.

This chapter describes the research design and methodology used in this study. Information about the respondents, data sources, data collection procedures, and the instruments used in conducting this study are also set out.

The research design for this study is a descriptive, multiple-case study that is analysed through both qualitative and quantitative methods. Questionnaires were used to gain insight into the opinions and perceptions of the participants about the use of African languages to study and master academic concepts in their courses. Another section of the same questionnaire focuses on the evaluation, accessibility, and usefulness of the online multilingual glossaries' website.

A quasi experiment in the form of two multiple-choice question tests per subject (i.e., Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of contracts) was conducted to evaluate the participants' level of understanding of their course concepts at the beginning of the research study, before the use of multilingual glossaries, and again towards the end of the study to determine any changes in their level of understanding of particular concepts after the use of the online multilingual glossaries.

A descriptive statistical method was used to analyse the student's academic experience and their level of understanding of their course concepts. Descriptive statistics are the numerical or graphical methods used to group and characterize the properties or factors of a particular sample. (Murray, et al., 2009).

Questionnaires, focus group discussions, and data on system interactions through Google Analytics (a web analytics service offered by Google) reports which were used as data collection methods. Additional data was also collected through an online questionnaire directed at the subject lecturers of the participants. Justification for each data collection method used in the study is discussed in detail. To ensure the integrity and validity of this study, both qualitative and quantitative criteria were used, as well as triangulation (Patton, 1999).

The epistemological position of this study is to establish how students use the ability of understanding concepts in their mother tongue to learn, understand, and apply English academic concepts, especially as second language speakers of English. This study is intended to present insights into the impact of using the online multilingual glossaries platform on academic experience and the success of students at CPUT.

3.2 Research design

According to Akhtar (2016), research design is a conceptual framework within which research is conducted. For Kerlinger (1986:279), a research design is the road map the researcher decides to follow during the research journey to answer the research questions as validly, objectively, accurately, and economically as possible. It is a procedural plan that details what and how different methods and procedures are to be applied during the research process.

The two definitions of research design offered by MacMillan and Schumacher (2001) and Leedy (1997) are similar in that they both describe research design as a plan for conducting research and collecting data to answer research questions.

MacMillan and Schumacher's definition specifically mentions the selection of subjects and the use of interviews to collect data, which suggests that their focus is on qualitative research. On the other hand, Leedy's definition is more general, describing research design as a plan for conducting research and creating a framework for the collection of data.

In this study the researcher can relate to research design as a plan for conducting research that outlines the methods and procedures for selecting participants, collecting data, and creating a framework for the collection and analysis of data. The specific methods used in this study vary depending on the research question and the type of data being collected, the overall goal is to create a structured approach that allows for accurate and reliable data collection and analysis.

There is a connection between the research design and the strategy. Durrheim (2004:29), defines research design as a strategic framework for action that links research questions to research strategy. In order to come up with a reliable and accurate conclusion, it is essential that the research design follows a well-thought-out methodology that is in agreement with the predetermined research type. A research design provides a researcher with a well-structured, objective research plan that enables researchers to evaluate the causes and effects of various dependent and independent variables.

3.2.1 Multiple-case study design

A case study is an investigation of a particular contemporary phenomenon within its real-life context, using multiple methods of collecting data (Yin, 2009). Stake (2006:vi)

states that multiple case studies examine something with lots of cases, parts, or members. Yin (2009:53), on the other hand, distinguishes between multiple case studies containing different components (called embedded cases) and multiple case studies that consist of several different 'experiments', each involving replication logic.

A multiple case study is also known as a collective case study; it investigates individual cases and provides information and explanations regarding a situation, phenomenon, or experience where the study of each case explains 'why' or 'how' and allows for elaborative data as a result of comparing across the cases to gain a deeper understanding (Schoepf & Klimow, 2022:252). A multiple case study is required when a study contains more than one single case. This is frequently linked to a number of experiments. The difference between a single case study and a multiple case study is that, in the latter, the researcher examines many cases to determine the differences and similarities among them (Stake, 1995; Baxter & Jack, 2008). Another distinction is that the researcher can analyse data both within and across situations (Yin, 2003).

Case studies are also suitable when a researcher cannot manipulate variables and individual behaviours. When a researcher wants to explore context and in-depth findings, the research design must be a case study. If a study includes more than one case, it is called a multiple case study. Case studies may provide both qualitative and quantitative data for analysis and interpretation as experimental research. A hypothesis can be developed in case studies as well. Multiple case studies are often stronger and more reliable than drawing on single case research, as they allow for more comprehensive exploration of research questions and theory development (McCombes, 2019).

Since the objective of this study is to determine the impact of the online multilingual glossaries tool on the academic experience and success of first year students, the multiple case study is highly appropriate. A multiple-case study design is well suited to strengthen the patterns of findings across the three departments concerned in this study: using Yin's (1994) replication logic, the researcher is able to identify subtle similarities and differences within a group of cases.

Figure 9 is a custom, graphical representation of a multiple case study design for this research study.

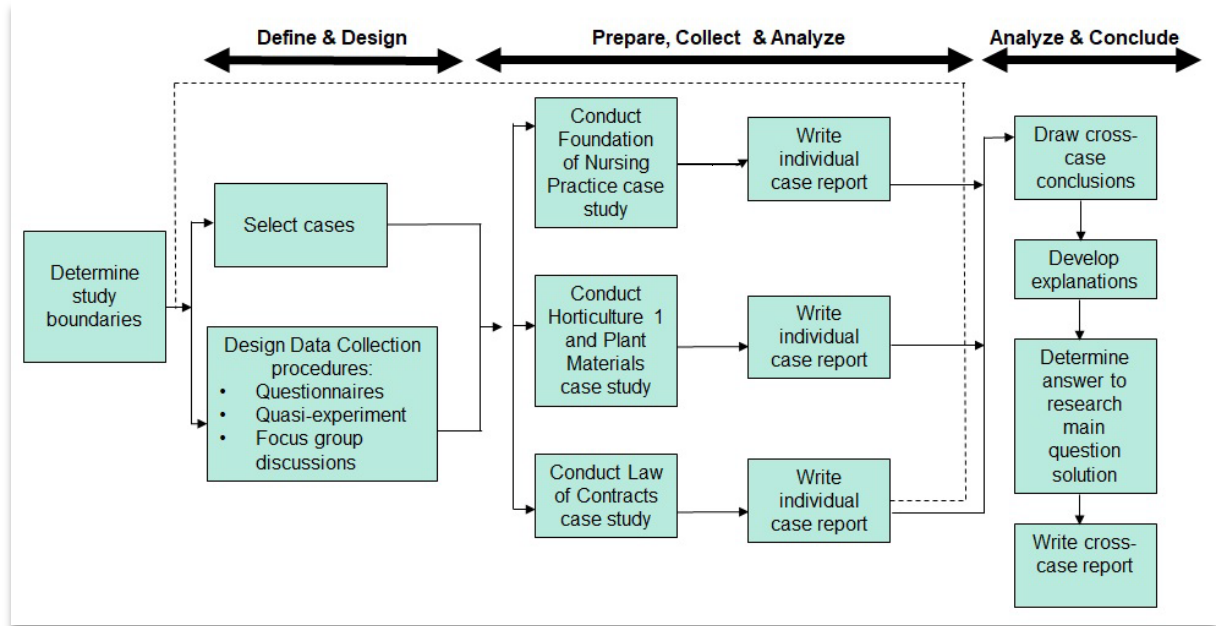


Figure 9: Multiple-Case Study Design, adapted from Yin, R.K. (2014)

The research strategy for this study is a multiple-case study design. Yin (2003) states that multiple case studies are needed when more than one case is included in a study. In this study, the researcher looks into three subjects, each of which is regarded as a case on its own. In these subjects, the researcher seeks to find similarities and differences, particularly regarding the participants' experience with the online multilingual glossaries.

3.2.2 Research approach

'Research approach' refers to a collection of steps that range from general assumptions to detailed methods for collecting, analysing, and interpreting data.

Creswell (2014) refers to a research approach as a plan and the procedures that cover anything from general hypotheses to specific techniques for gathering, analysing, and interpreting data. The selection of a research approach is based on the nature of the research problem, the researchers' personal experiences, and the audiences for the study. Creswell further explains how a research approach belongs in the intersection of three components: philosophical worldviews; research designs; and research methods (Creswell, 2014), as illustrated in Figure 10.

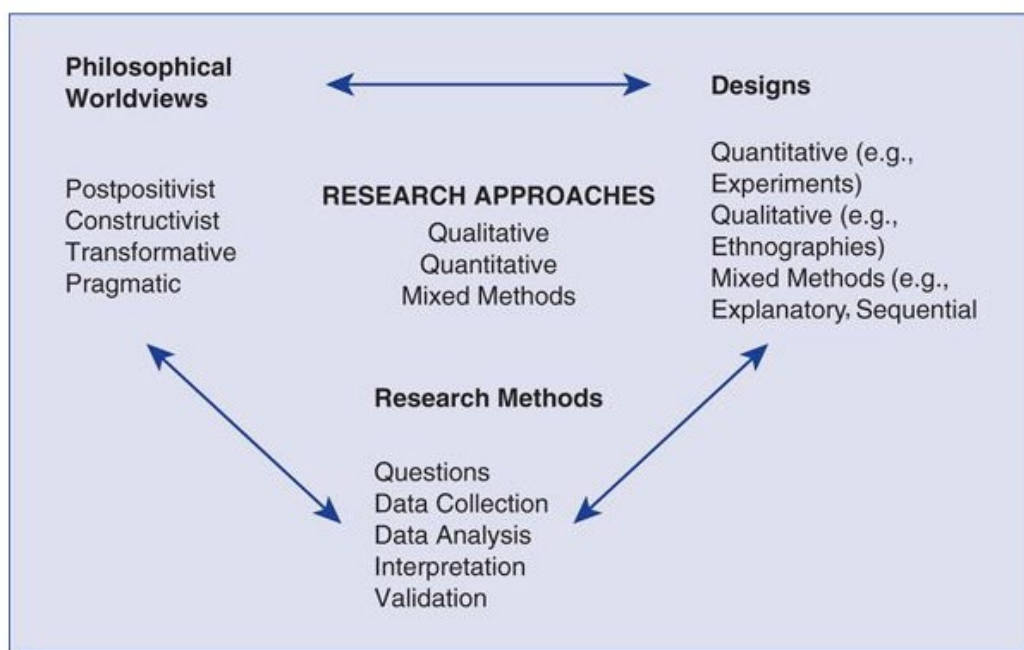


Figure 10: Components of research approaches (Creswell, 2014)

Mixed methods approach

The mixed methods research approach is determined by the nature of the research problem. There are two main categories of research approaches to the collection and analysis of data (Chetty, 2016). This study employs a mixed methods research approach for an opportunity to collect diverse data types. This approach is considered the best to provide a complete understanding of the research problem rather than either qualitative or quantitative data alone, as recommended by Creswell (2014:48).

3.2.3 Mixed methods research methodology

In a single study or programme of inquiry, Tashakkori and Creswell (2007) define mixed methods research as research in which the investigator collects and analyses data, integrates the findings, and draws inferences, utilizing both qualitative and quantitative approaches or methods. Mixed methods can help researchers gain a more complete picture than a standalone quantitative or qualitative study, as it integrates the benefits of both methods.

The mixed methods research approach originated around the late 1980s and early 1990s. It is based on work from individuals in diverse fields such as evaluation, education, management, sociology and health sciences. Kemper, Springfield, and Teddlie (2003) described a mixed methods design as the parallel gathering and

analysis of both qualitative and quantitative data (concurrent mixed method design in which two types of data are collected and analysed in sequential form).

Using mixed methods is more than just one kind of research, Creswell, Fetters and Ivankova argue (2004:7). Integrated data collection implies that qualitative and quantitative data are collected together. In some stages of the research process, the two are related or mixed. In addition, they further suggest that the basic idea behind mixing is that neither quantitative nor qualitative methods can fully capture the trends and details of a situation by itself. When used together, they allow for the capture of trends and details about the situation. A combination of qualitative and quantitative data allows for a more thorough analysis, and they complement each other.

The rationale for using a mixed methods approach for this study is to provide a rich and holistic understanding of the objectives of this study while getting the added value of intersecting qualitative and quantitative data, in line with this, the following are the objectives of this study:

- To determine students' attitudes towards, or perceptions of, the online multilingual glossaries.
- To establish how students use the online multilingual glossaries for the purposes of meaning making.
- To determine the extent to which students' level of understanding of particular concepts impacts their learning.

3.3 Data collection

Data collection is the process of gathering and measuring information on variables of interest, in an established, systematic manner, that enables the researcher to test hypotheses, answer research questions, and determine the outcomes of a study. Data collection is an important part of any research project, it allows the researcher to gain first-hand knowledge and original insights into the research topic (Bhandari, 2022).

Bhandari (2022) states that, although the methods and aims of data collection may differ from one field to another, the overall process of data collection remains largely the same. A researcher should consider the following before starting to collect data: (i)

the aim of the research; (ii) the type of data that will be collected; and (iii) the methods and procedures that will be used to collect, store and process the data.

Data collection for this study involves:

- a) questionnaires for the student participants, with closed and open-ended questions, that are administered to evaluate the accessibility of the online multilingual glossaries platform and the language used in the multilingual glossaries;
- b) a quasi-experiment in the form of pre- and post-multiple-choice test exercises to establish students' knowledge of academic concepts before and after the use of online multilingual glossaries;
- c) focus group discussions to determine students' reflective opinions and experience on the use of the online multilingual glossaries and its platform;
- d) questionnaires for the subject lecturers to establish their opinions on the use of the online multilingual glossaries, and to establish if they have noted any effect on the students' academic performance during the period of this research study; and, lastly,
- e) Google analytics reports to show platform usage, user-behaviour patterns and engagement with the online multilingual glossaries website.

3.3.1 Purposive sampling

Purposive sampling, also known as judgment sampling, is the deliberate choice of participants due to the qualities the participants possess. It is a non-random technique which requires no underlying theories or set number of participants. Purposive sampling is typically used in qualitative research to identify and select the information-rich cases for the most proper utilization of available resources (Etikan et al., 2016).

Kumar (2014:228) states that, in qualitative research, a sample is selected in such a way that it is unbiased and is representative of the population from which it is selected. By contrast, in quantitative research, the selection of a sample is influenced by the ease in accessing the participants, and the researchers' judgement that participants have the qualities that are needed to answer the research question.

In this study, the researcher considers purposive sampling to be the most appropriate sampling strategy because, according to Etikan, Musa and Alkassion (2016: 3), this sampling technique

... involves identifying and selecting individuals or groups of individuals that are proficient and well-informed with a phenomenon of interest. In addition to knowledge and experience, and note the importance of availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner.

In accordance with these authors, in this research, participants' qualities included these: the students' level of study (first year); students for whom English is not a first language; the students' willingness to take part in the study; and the role played by the subject lecturers in supporting the study. These qualities best enable the study to answer the research questions (see section 1.3.1 of this document).

In order to not include any unwilling participants, the entire population of each case was invited to take part in the study freely.

White (2004:49) describes a population as "the target group of possible candidates who can be included in a research study". All the willing participants must also meet the qualities needed to address the research questions; therefore the study further utilises the total population sampling technique as a purposive sampling method. According to Etikan et al., (2016:3), total population sampling (TPS) is commonly used where the entire population that meet the criteria are included in the study being conducted.

The sampling criteria for this study included the following qualities: (a) first year students enrolled for the following subjects: Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts from the departments of Nursing, Horticultural Sciences, and the Applied Law Unit respectively. The chosen subjects are presented not in any particular order or hierarchy; (b) students' diverse cultural, ethnic, and educational backgrounds reported on the CPUT student profile demographics, where 66.9% of enrolments represented the African group (CPUT MIS,

2018); and (c) the convenient factor that the majority of the first year students are not first language English speakers.

It is also important to note that no student language group(s) were excluded from this study. This was an intentional decision by the researcher so as to provide an adequate and inclusive representation of the overall profile of students that need to be exposed to the online multilingual glossaries. No English first language students were denied access and use of the online multilingual glossaries at any point of this study, nor beyond the research period.

The sampling procedure involved selecting all students who indicated their interest to participate in this study. All participants voluntarily indicated their commitment by signing a non-obligation consent letter. Within the volunteers, the initial plan involved a group of ten (10) participants, carefully selected from each of the three subjects and based on their interest and keen willingness to participate consistently in the study. These participants was a group of thirty (30) participants who comprised the experimental group for this research study.

Data was eventually collected form all participants who remained active in the study up until the time for data collection. A full account of participants is detailed in the analysis section in chapter four of this thesis. Data was collected at different time periods for each of the cases in this study. All engagements with participants were subject to the availability of time afforded by the subject lecturers for the researcher to engage with the participants. A minimum number of ten (10) participants from each of the three subjects participated in the focus group discussions for data collection purposes.

The study was introduced and conducted during lecture times while students were in their familiar environments and natural settings, i.e., in various lecture rooms of the relative departments at the CPUT Bellville campus for two of the subjects (Horticulture 1 and Plant Material Studies, and Law of Contracts), and in Athlone and Stickland campuses for the other (Foundation of Nursing Practice).

The participants were encouraged to use the online multilingual glossaries outside of the classroom settings as much as they needed to. The student questionnaires were administered first, followed by the pre-test, quasi-experiment multiple-choice exercise.

Participants were allowed to use the online multilingual glossaries for a time period that was equal to one full term. Participants were then subjected to a post-test, quasi-experiment in multiple-choice exercise format. Focus group discussions with the participants followed with the last data collection activity. The multilingual glossaries website analytic reports were retrieved from Google Analytics. Lastly, towards the end of the research study period, the lecturers' opinions were solicited, using a questionnaire.

3.3.2 Questionnaires

The idea of a questionnaire is defined by Remenyi et al. (2002:290) as "the collecting of a vast quantity of information, generally numeric, or evidence that will be transformed to numbers, normally by the use of a questionnaire". A questionnaire is a set of questions designed to elicit trustworthy responses from a sample of people with the goal of determining what they do, think, or feel. Kumar (2014) describes a questionnaire as a written list of questions which are answered by respondents; they interpret what is expected; and then write down the answers themselves. Questionnaires should be developed in an interactive style, so that respondents feel as if someone is talking to them (Kumar, 2014:178).

The advantages of questionnaires include saving time and financial resources, which render the questionnaires comparatively convenient and less inexpensive than other data collection methods, in particular when questionnaires are administered collectively to a research population (Kumar, 2014:181).

In this study, the researcher used the collective method to administer questionnaires to the participants. This researcher-administered questionnaire takes place in person between the researcher and respondents. The researcher visited the participants during a planned time which was within a class period agreed upon with each of the subject lecturers for each of the subjects concerned.

The questionnaire was explained in detail to all the participants. Anonymity and freedom of choice to respond to the questionnaire was emphasised before handing out the questionnaires. The respondents were given twenty minutes to respond to the questionnaire while the researcher was present in class. This was an intentional

decision as the researcher would be able to answer any questions the respondents might have in regard to the questionnaires or the research project as a whole. According to Kumar (2014: 179), administering questionnaires in groups provides a very high response rate because fewer people often decline to participate. Surveys, in Kumar's opinion (2014), also offer a greater degree of anonymity. In this study, the respondents were not required to put any personal or student identification information on the questionnaires. Though the researcher was occasionally with the participants to discuss the purpose, relevance and importance of the study as understood by researcher, face-to-face interaction was used.

3.3.3 Quasi-experiment

A quasi-experiment is a type of research design that intends to establish a cause-and-effect relationship. The primary difference between a true experiment and a quasi-experiment is that, in a true experiment, subjects are randomly assigned to groups, while the groups are not randomly assigned in quasi-experiments, unlike in a true experiment, instead subjects are assigned by self-selection or administrator judgment (Cook, 2015). Hox and Boeije (2005) also attest that quasi-experiments are important because they typically involve a research design that allows strong causal inferences.

In quasi-experimental design, researchers often do not have control over the treatment of a group, but instead they study pre-existing groups that received different treatments after the fact. However, control groups are not always necessary.

“Quasi-experimental designs are mainly used in educational studies where random assignment is not possible to ensure reliability, because the researcher is obligated to use participant groups in their natural environments” (Jonker, 2016:27). Quasi-experiments, unlike true experimental designs, do not use random assignment of participants; instead, participants are assigned to experimental groups depending on other factors, mostly factors that are of interest to the researcher.

Here in Table 2 are some differences between true experiments and quasi-experiments:

Table 2: Differences between quasi-experiments and true experiments (Thomas, 2022)

True experiments	Quasi-experiments
Participants are assigned randomly to the experimental groups.	Participants and not randomly assigned to the experimental groups.
Participants are categorized and then put into a respective experimental group.	Researchers often do not have control over the treatment of a sample group .
Researchers design the treatment participants will go through.	Researchers do not design a treatment.
There are no various groups of treatments.	Researchers study the pre-existing groups of treatments received by a sample group.
Include control groups and treatment groups.	Do not necessarily require control group (although they are commonly used).
Do not include a pre-test.	Include a pre-test.

A quasi-experimental design has the following advantages (Voxco, 2021):

1. It could be used to choose what's best for the population. This is often referred to as having external validity.
2. The researchers have more control over the variables when they can control the variables.
3. It is also possible to combine the quasi-experimental method with other experimental methods.
4. Greater transferability is present.
5. It is a natural process that has been fine-tuned by the researchers.
6. It involves genuine issues and solutions rather than fabrications.
7. It improves control over the third variable, also referred to as the confounding variable, which affects cause and effect.

The reason why the researcher did not use a true experiment in this study includes the following disadvantages:

- True experimental designs are too expensive. A lot of resources are required to recruit and manage many participants, necessary for a representative sample.
- True experimental study is carried out in a thoroughly controlled setting. Because a controlled scenario is not indicative of real-life conditions, the outcomes may not be accurate.
- The procedure of setting up and running a real experiment takes a long time. This is due to procedures such as selecting a large enough sample, collecting respondent data, assigning respondents to groups at random, monitoring the process over time, recording changes, and making modifications.

Quasi-experiments were administered in each case to establish the participants' level of knowledge of specific academic concepts in their study fields, before and after the use of the online multilingual glossaries.

This data collection technique allowed the researcher to engage with the participants in their existing and familiar learning environments. In this activity, participants took part into two tests (pre- and post-tests), a process that is known as "within subject design experiment".

3.3.4 Focus group discussions

Focus groups are used to collect information in a group environment, either through predefined interview questions that the moderator asks each member in turn, or through a script to promote group discussions. They are best employed when the total of a group of people's perspectives on their experiences may provide more insight into social phenomena than a single individual's perspective. Focus groups also allow researchers to record participants' reactions to other participants' remarks and thoughts, allowing them to document parallels and variances in viewpoints (Paradis et al., 2016).

According to Mack, Woodsong, MacQueen, Guest and Namey (2005), focus groups can elicit information about the norms of a group and provide a broad overview of issues of concern to the group, as well as perspectives within that community. Additionally, focus groups are typically less formal than other types of interviews, which leaves room for any issues that may arise from interactions within the group.

Powel and Single (1996:499) define a focus group as a group of people selected and gathered by researchers to discuss and comment on, from personal experience, the subject that is the topic of the research. Focus groups have the advantage that they enable the researcher quickly to identify the full range of perspectives held by the respondents (Powel & Single, 1996:504).

Furthermore, focus groups strategically allow participants to clarify or expand upon their contributions to the discussion in the light of points raised by other participants, thus expanding on the contributions that might be left underdeveloped when using a different data collection method (Powel & Single, 1996:504). According to Acocella (2012), focus groups are an apparently simple technique to set up; but, to achieve good findings, a lengthy preparation process is required that changes every time, depending on the intended goal and cognitive outcome.

Focus group discussions are conducted based on the different and specific subject groups, where participants discuss and reflect on their attitudes towards, and perceptions and experiences of, using the online multilingual glossaries and its platform. Focus group discussions contributed the self-reported information of participants in this study to bring insight into the overall effect of the online multilingual glossaries on the academic experience of the students who used the online multilingual glossaries at CPUT.

In this study three focus group discussions were held. First the Law of Contacts group where 25 participants took part in a discussion with the researcher; then the Horticulture¹ and Plant materials group was a second focus group discussion to take place with 15 participants; and finally, a focus group discussion with 20 participants was held for the Foundation of Nursing Practice group.

The participants, on request, were encouraged to volunteer themselves to be part of the focus group discussions. The researcher set up a different group discussion date with each set of participants from each of the subject cases. Venues for focus group discussions were organised in collaboration with the participants. All focus group discussions were done in the lecture room settings at two campuses (Athlone campus for the Foundation of Nursing group and at different locations within the Bellville campus for the Horticulture 1 and Plant Material Studies and Law of Contracts groups

respectively) at the participants' relative departments. Permission for recoding all the discussion sessions was requested from the participants prior commencements.

Finer details describing the findings arising from analysis of the original data from focus group discussions are outlined in full in the findings section in Chapter Four of this thesis.

3.3.5 System analysis (Google Analytics)

Google Analytics is a free web analytics solution that provides webmasters with insightful information about how visitors find and interact with their websites (Fang, 2007). According to Dyrli (2006:72), Google Analytics is the most sophisticated web analytics by far. Web analytics involves the collection, reporting and analysis of website data for the purposes of determining the success or failure of the website objective(s) and to improve the user's experience. Some examples of web analytics tools include StatCounter, Matomo, Hotjar, Smartlook, Parse.ly, Segment, Heap, Siteimprove, and Google Analytics (Web Analytics Basics, 2020).

The researcher used the web analytics method to figure out how the users had been using the multilingual glossaries website. According to Fang (2007:2), web analytics provide objective and multi-layered statistical data in a visual way for web developers to better understand the interaction between their users and their websites.

In this study, the researcher analysed the effectiveness of the entries (visit behaviour and length of the session), depending on the traffic source which represented the direct visit, in link entries (Plaza, 2011). The researcher looked into the link entries information to establish the usage of the multilingual glossaries platform and to gain insight to information, including: (i) content usage patterns; (ii) the number of users per region; (iii) the number of user sessions; and (iv) the number of new users per month. This information ultimately helps to bring insight into the statistical engagement of users with the platform.

3.4 Data analysis method

Data analysis is the process of understanding and interpreting raw data in order to address the aims and provide relevant answers to the research question (Henning, Van Rensberg & Smit, 2004). Stake (1995:71) notes that data analysis does not begin

at any particular moment; and that analysis involves giving meaning to the first impressions, as well as the final compilations of the collected data.

In any research, data analysis is guided by the research questions, and based on the theoretical framework of the study (Jacelon & O'Dell, 2005). Qualitative data analysis often entails categorizing and labelling data. These categories may also be referred to as tags, nodes, or codes (Goodrick & Rogers, 2015:562). A consideration for computer-aided qualitative data analysis software is exercised. This program assisted the researcher to identify patterns in the data that are collected across the three cases in this study.

In this study, qualitative data analysis followed the three basic steps, as stated here:

- (a) Prepare and organise data, which involves transcribing focus group discussion recordings; and ensure all data to be included in the analysis process is present and available, including lecturer opinion responses.
- (b) The data is then coded: the codes are grouped into relevant data categories, which are further reduced into themes. The purpose of using coding in qualitative data analysis is to discover patterns among the data so that it reflects theoretical understandings of the findings achieved in the research study (Babbie, 2007:384).
- (c) Data is represented in tables, narrative form, and graphics where necessary.

The processes of data analysis and preparing findings is inter-related and is done simultaneously.

The following is a visual representation of the data cleaning and analysis that was adopted in this research study:

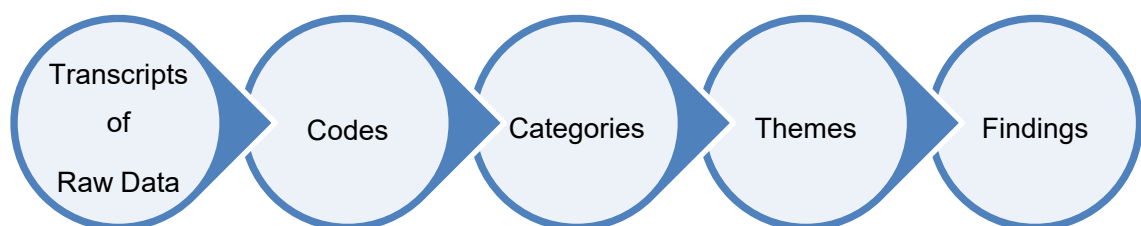


Figure 11: Data analysis process

A careful exercise to undertake steps to ensure the validity and accuracy of the research findings was done, as recommended by Creswell (2007). In qualitative research, validity is the extent in which the data and the interpretation of the data are credible. Creswell identifies triangulation as a strategy for ensuring validity. This refers to using multiple data resources to build up a complete picture of a phenomenon (Creswell, 2007). In this research study, the triangulation process was employed to allow the findings of the qualitative analysis to inform the findings of the quantitative study.

The narrative data representation strategy follows Creswell's most popular approach, which is to describe the quantitative and qualitative findings side by side. For example, the representation of the quantitative statistical findings is presented first and then qualitative quotes are provided either to confirm or refute the statistical findings (Creswell, 2012:542).

The quantitative data analysis process seeks to calculate the average scores of the participants, based on the quasi-experiments for the pre-tests and also for the post-tests across all three cases concerned in this study.

3.4.1 Validity in the qualitative study

In this study the researcher ensured the validity of data in the following ways:

The researcher carefully selected and used an appropriate research design of a descriptive multiple case study. This design is most appropriate for the research question and valid for the type of data that is collected for this research.

Purposive sampling, a suitable sampling technique, was used to make sure that the sample was representative of the population the researcher was researching in this study. The varied cultural backgrounds and the first year level of enrolment of students were amongst the determining factors in this regard.

Questionnaires, focus group discussions, quasi-experiments, and Google Analytics reports were some of the valid and reliable data collection methods used. These measures were consistently and accurately applied across all of the cases included in this study to quantify the variables the researcher was interested in.

Bias tendencies were constantly observed and mitigated to minimal levels by the researcher. For example from the beginning of the study, all students enrolled in each case (Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts) were invited and encouraged to take part in this study. Furthermore all students who decided not to take part we welcome and had access to use the CPUT online multilingual glossaries unlimited and as they desire, to help learn and master their course concepts using different languages other than English only.

The researcher made a significant effort to control irrelevant factors that might have had an impact on the study's findings. This was accomplished by the meticulous selection and measurement of the research's purposefully studied factors.

In this regard, focusing on the research questions throughout the data collection period was a key exercise. However, some extraneous variables were put forward by the participants in the focus group discussions and they are mentioned the findings section of the study.

Data was properly analysed using the most recent version of a contemporary data analysis program at the time (ATLAS.ti, version 9). To make sure that the participant's comments and voice were recorded, understood accurately, and meaningfully, the researcher also repeatedly and meticulously transcribed all focus group discussion recordings.

Validity in the quantitative study was determined by using the quasi-experiment in this study in calculating the average scores resulting from the multiple-choice exercises of the pre-tests and post-tests. Then a comparison of the average scores from the pre-and-post-tests was used to determine any change in the levels of understanding of concepts before and after the use of the online multilingual glossaries.

3.4.2 Triangulation

A triangulation of data collection methods was used in the qualitative strategy of this study to develop a comprehensive understanding of the study (Patton, 1999).

Triangulation, according to Hussein (2009), is the investigation of the same event using two or more theoretical viewpoints, data sources, investigators, and analysis techniques. To address a research topic, triangulation in research refers to the use of various datasets, techniques, hypotheses, or investigators. It is a research technique

that can increase the validity and reliability of the results. Although triangulation is frequently used in quantitative research, it is primarily used in qualitative research. Methodological triangulation is required for all mixed methods study (Bhandari, 2022).

According to Denzin (1978:26), the logic of triangulation is based on the premise that “no single method ever adequately solves the problem of challenging caused factors, because each method reveals aspects of the empirical reality, multiple methods of observation must be employed”. Schuh (2009:168) also defines triangulation as using multiple sources of data, data collection methods, or both, and multiple investigators, to collect data.

In this study, triangulation is used to facilitate validation of data in each case concerned by cross verification from more than two sources. These sources are questionnaires, the pre and post-tests of the quasi-experiment and the finally the data collected from the focus group discussions. This tests the consistency of findings obtained through different instruments and increases the chance to control some of the threats that might influence the findings.

3.4.3 Research ethics

Research ethics are a set of principles that guide the design and execution of one’s research. When collecting data from people, scientists and researchers must adhere to certain ethical guidelines (Bhandari, 2021).

Permission to conduct the research study at CPUT was requested from the official CPUT Ethics Committee for the purpose of acquiring ethical clearance to conduct research at different departments (Unit for Applied Law, Nursing, and Horticultural Sciences). Further permission was requested from the heads of departments for each subject. All ethical clearance and permission letters are included in Appendices A and B of this thesis.

Consent letters were read to and provided to all participants to ensure understanding and, ultimately, the confidentiality and legality of the data obtained. A sample of the consent letter is added in Appendix C. Permission to interact with the student participants was requested from the relevant subject lecturers through careful planning and scheduling telephonically and via email, prior to the commencement of the study and ahead of each engagement with the students. All student participants and lecturers

involved were provided with the information sheet with the details about this research study.

3.5 Limitations of the study

Limitations of a study can be associated with the research design, sampling strategies, time, and certain other factors. In addition, limitations can impact on the research study findings, conclusions, and generalization.

- a) The limitations of a mixed methods research include the following:
It takes more time and resources to plan mixed methods research than when using single method study. This may discourage researchers who have limited to complete their study within a stipulated time period.
- b) Findings from one paradigm may contradict another paradigm. It becomes unclear how such deficiencies should be resolved (Harrington and Wambugu, 2021).

Multiple approaches must be used to overcome the limitations of any one method (Jackman, 1985; King, Keohane & Verba, 1994; Bates et al., 1998; Coppedge, 1999; Granato & Scioli, 2004).

Some of the limitations of a multiple case study include difficulty to organise data analysis; and integration strategies need to be carefully thought through. Reporting of findings from multiple case research studies is also challenging at times, particularly in meeting the word limit for some research journals. It is also always a challenge to justify the choice of case(s). The researcher intended to overcome this drawback by thoroughly following the “Multiple-case study Design” as shown in Figure 5.

Some of the limitations of quasi-experiments include the following: it's prone to human mistakes; its internal validity is lower than that of actual experiments; and it may allow the researcher's personal bias to enter the equation.

3.6 Conclusion

This chapter has described the research methodology, the population sample, data collection strategies and the instruments used to ensure reliability and validity of the study. In Chapter 4, the data obtained from applying the research methods described in this chapter are presented and analysed.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter presents the data collected from the respondents (students and their lecturers), as well as the system's report from Google Analytics.

A mixed method approach was used in collecting data to answer the following research questions:

1. What is the impact of the online multilingual glossaries platform on the academic experience of the students selected for this study at CPUT?
2. What are the students' attitudes towards the online multilingual glossaries?
 - 2.1 What are the students' perceptions of the online multilingual glossaries?
3. How do students use the online multilingual glossaries for purposes of meaning making?
4. To what extent does the students' level of understanding of particular concepts impact on their learning?

In this chapter, data is grouped by qualitative and quantitative genres. Data collected through questionnaires and focus group discussions is represented in narrative form, tables, and graphs. The questionnaire and focus group discussion questions can be seen in Appendices D, E and F. The qualitative data collected is analysed and presented in graphs.

Each of the subjects dealt with in this research is treated as a case study. The researcher collected the student respondents' opinions of the online multilingual glossaries website and the accessibility (understandability) of the language of the glossaries (academic concepts) through a questionnaire. A pre-test in the form of a multiple-choice exercise was administered to gain insight into the level of understanding of the concepts at the beginning of the research study. Test scores were collected from this exercise. The student respondents were given the freedom to access the online multilingual glossaries website at their leisure as a study aid. Simultaneously, the user activity patterns for each subject were monitored through

Google Analytics. This was done to determine if the online platform was indeed being accessed and used (firstly within CPUT), as well as to find out the frequency of user visits. Reports were collected through Google Analytics.

A questionnaire was sent to each subject lecturer for their opinions on the use of the online multilingual glossaries in their courses. Feedback was collected from the lecturers, analysed and synthesised for reporting the findings. The data analysis in this chapter lends insight into the objective of this research study, which is to determine the impact of the online multilingual glossaries tool on the academic experience and success of first year students.

Table 3 is a summary of data collection instruments and their objectives as used within the different research methods.

Table 3: Research methods and their objectives (Manashe et al., 2020)

Research method	Data-collection Instrument	Objective	Number
Questionnaires	Student questionnaires	To obtain participants' opinions and perceptions on the accessibility of the online multilingual glossaries platform and the languages of the glossaries.	Two hundred and thirty-five questionnaires were distributed amongst students of the three subjects.
	Lecturer questionnaires	To obtain subject lecturers' perceptions and opinions about the use of multilingual glossaries in their courses.	Three questionnaires were distributed amongst the subject lecturers, one for each lecturer.

Research method	Data-collection Instrument	Objective	Number
Interview techniques	Focus group discussions	To obtain participants' opinions, experiences and recommendations about the multilingual glossaries platform and the use of African languages in higher education.	Three focus group discussions were held, one for each subject.
Quasi-experiment	Pre- and post-multiple choice exercises	To determine participants' understanding of their course concepts prior and after the use of multilingual glossaries	One pre-test and one post-test were conducted per subject.
Google Analytics	Website analytics user activity report	To determine how often users engaged with the platform	A combined report was retrieved, showing platform user activities across the three subjects.

4.2 Data analysis: qualitative study

Questionnaires were used to collect both qualitative and quantitative data for the study, while the focus group discussions were used to collect qualitative data only. The questionnaire had two sections to collect data. These sections related to (i) the accessibility of the multilingual glossaries platform and (ii) the accessibility of the language used in the glossary content itself.

The following sections will outline the presentation of data collected through the questionnaires and focus group discussions.

4.3 Analysis of data from focus group discussions

The analysis strategy for the focus group discussions involved using a qualitative analysis software package, ATLAS.ti (version 9) to create codes from the transcripts. As Forman et al. (2008) posit, an increasing number of qualitative researchers are using software to manage, facilitate and interpret research data. Amongst the commonly used data analysis software are ATLAS.ti, MaxQDA, and NVivo software packages. These researchers further emphasize that software is a tool that can enhance the efforts of the qualitative researcher to help manage, retrieve, and connect data, but cannot perform data analysis. Codes were grouped according to related concepts (categories). The 'grouped codes' were further analysed and reflected upon to create 'smart groups' (themes). Following careful reflection to meet the requirements of this research, the researcher traced the themes which, in turn, led to the findings.

The following section elaborates on the use of ATLAS.ti to conduct data analysis. ATLAS.ti is a tool for carrying out and keeping track of qualitative data analysis of large bodies of textual, graphical, audio and video data (Kalpokas & Radivojevic, 2021). The software accommodated the upload of the full focus group discussion transcripts for all three subjects that included a large quantity of text. Particular codes were defined by the researcher, relative to the analysis of the large quantities of text. The researcher prepared transcript documents and converted the final documents to pdf format for uploading into ATLAS.ti.

The researcher carefully went through each transcript to create codes. These codes were grouped to create categories. The categories were further grouped into smart groups, which represent themes in this study.

The code groups (categories), were grouped according to similarities and relevance, using a feature that allowed the researcher to create smart groups, which represent themes in this study, by linking all similar categories under one smart group. For example, "attitudes towards, and perceptions of, mother tongue" is based on linked categories such as "advantages of using mother tongue for understanding" and

“advantages of using mother tongue to facilitate communication”. The analysis revealed eight categories, summarised and presented in Table 4:

Table 4: Categories and themes

Categories (code groups)	Themes (smart groups)
Positive attitudes towards, and perceptions of, multilingual glossaries	Attitudes towards, and perceptions of, multilingual glossaries
Negative attitudes towards, and perceptions of, multilingual glossaries	
Positive attitudes towards, and perceptions of, mother tongue	Attitudes towards, and perceptions of, mother tongue
Negative attitudes towards, and perceptions of, mother tongue	
Difficulty with the use of English language	
Positive attitudes towards, and perceptions of, multilingual glossaries	Suggestions for multilingual glossaries improvement
Suggestions for multilingual glossaries improvement	

4.3.1 Attitudes towards, and perceptions of, multilingual glossaries

Theme description: Highlighted here are the respondents’ points of view and insights into the multilingual glossaries platform. The data shows the experience of the respondents, ranging from their views on the look and feel, the accessibility, the language representation, and functionality of the multilingual glossaries platform.

In this section, the letters ‘FG’ attached to the subject name stand for a Focus Group (e.g., Law of Contracts FG).

The following were direct responses from the participants: F

“It’s colourful, not like, what I mean is that it grabs your attention. It’s not like a black and white thing, but it gives you a visual content.”

Law of Contracts FG

Another participant said:

“It’s very simplistic but there is something about the colour of the background of the page that actually draws you attention. That makes you want to read on and see what’s going on.”

Foundation of Nursing Practice FG

The above responses are consistent with the findings of Bonnardel, Piolat and Bigot (2011:78) in their study on Website appeal regarding the impact of colour and users’ cognitive processes. Their findings highlighted that colour influenced the way that users interacted with the website, as well as their behaviour and cognitive processes, such as how they remembered information from the website.

Participants also noted the ease of accessibility and comfort they derived in using the online multilingual glossaries platform.

Some authors highlighted some benefits of online learning and using technology in education, stating, “It is more self-guided so I can spend more time on the concepts that I need help with and less on concepts that I can pick up quickly” (Kirtman, 2009:110). Self-regulated learners have a tendency to use various “cognitive and metacognitive strategies to accomplish their learning goal” (You & Kang, 2014:126; Gilbert, 2015).

A participant noted:

“You don’t have to be like on campus to access the website, you can use it at the comfort of your own home, at work, anywhere.”

Law of Contracts FG

Another participant stated:

“So basically if it’s done and online it is less time consuming, and everything is working well online.”

Horticulture 1 and Plant Material Studies FG

Another participant in the same focus group added:

“I think it is beneficial, because we have smartphones, so you have access to the internet at the tip of your hands. I think if you don’t use the platform but you have your smart phone, then it’s up to you. While sitting in the bus you can just check.”

Horticulture 1 and Plant Material Studies FG

The above quotes indicate the relative ease with which students are able to access the CPUT online multilingual glossaries. Evidently, students have no trouble using their smartphones to access the CPUT’s online multilingual glossaries.. Not only does this relate to ease of use but it also means that students can access it in several locations, and not necessarily only while on campus.

On language representation, a participant in the Law of Contract focus group had this to say:

“There was no Latin terms for us Paralegals who are doing Law so we have no legal dictionary at this place, and we don’t know how to pronounce some of these words, so we would like you to add Latin”

Law of Contracts FG

Geduld (2019) comments: “the fact that students had to take courses in English, Afrikaans and Latin was believed to further hinder access to education for black students”. It is therefore important to add Latin concepts to the Law of Contracts multilingual glossary to help the students master these concepts too.

A participant voiced their concern on the limited languages of the Law of Contract glossary as they posed the following question:

“Out of all the languages here, why do you have only Afrikaans and isiXhosa qha?”

Law of Contracts FG

Another participant’s opinion on the languages was as follows:

“I think it’s Ok for self-studying, like if mna I try to make sense of what is said in English ngesiXhosa, it will make sense to me, for self-studying.”

Horticulture 1 and Plant Material Studies FG

One participant with impaired vision voiced a concern about the multilingual glossary platform not having sign language support function or media:

“You (referring to the researcher) don’t have the sign language there.”

Law of Contracts FG

A participant was referring to the simplicity of language in the glossary when they said,

“Afrikaans is baie baie maklek”.

Law of Contracts FG

In the above quotes, while some participants were not happy about the limited languages of the glossaries, other participants were satisfied with the available languages, stating that they were useful for self-study. One participant even mentioned that the Afrikaans language in the glossary was easy to grasp.

On the functionality of the platform, participants in the Law of Contract focus group mentioned their favourite feature of the multilingual glossaries platform by highlighting the function that allows the user to switch between the Afrikaans and isiXhosa languages, based on the user’s preferred language of learning particular concepts:

“The switching of languages is my favourite feature”

Law of Contracts FG

4.3.2 Attitudes towards, and perceptions of, mother tongue

This theme highlights participants’ point of view and insights into the use of mother tongue in higher education, especially in their courses. Some participants felt that using their mother tongue to learn course content was helpful because it provided better

understanding when learning concepts. Participants explained their feelings about using their mother tongue to understand course content: A participant from Horticulture said:

“Learning using your mother tongue, I guess it helps, it does help at some point because that’s the language you are familiar with, that’s how you get to understand most of the things”

Horticulture 1 And Plant Material Studies FG

Another participant in the same focus group added:

“It makes it easier for you to study and in the exam it’s not that difficult, you just know that ok you have learned it in isiXhosa”

Horticulture 1 and Plant Material Studies FG

These responses are consistent with Cummins’s (1991, 1999) interdependence theory and the concept of common underlying proficiency, whereby the knowledge of language, literacy and concepts learned in the L1 (mother tongue) can be accessed and used in the second language once oral L2 skills have been developed.

By contrast with the highlighted views already mentioned, other respondents felt that using mother tongue would not be suitable for them, giving these reasons:

“The thing is when you learn ngesiXhosa and when it comes to exams we write in English, so you think ngesiXhosa and you must use your everything and your arms to write it in English”.

Law of Contracts FG

Similarly, another participant said:

“I think in me speaking Afrikaans, sometimes it’s hard because I don’t ... English is not my first language, so I have to go to a vocabulary or go online to search for the meaning of the word in English. Especially, in nursing language. So sometimes, it is a bit hard but I prefer English because it is the universal

language here. So, ja. I do not think ... I will understand it better when I translate it in Afrikaans but ja. So but it still helps”.

Foundation of Nursing Practice FG

The above responses are consistent with the findings of (Dalvit, 2004:89) that most respondents in his study highly valued English as a medium of instruction and most notably as a language of examination. However, these respondents did not agree on whether isiXhosa could be used as a medium of instruction in class.

4.3.3 Difficulty with the use of English language

This theme highlights participants' views about their difficulties associated with the use of English language in class. The respondents' feelings included difficult lecturer accents that prevented them from grasping content in class. A respondent expressed this view:

“I think Mna, it plays a role because, you know students ... we've got an attitude, it's almost like if I get an African thing, say for an example our physics lecturer I think he is not from South Africa, but the way he says some words, then you take time to like actually think, what was he saying when he said this particular word, but he said it in English, it's how his accent comes to play, because you see the lesson is going and I'm still trying to make sense of the word that he said”.

Horticulture 1 and Plant Material Studies FG

The above comment is closely connected to the following Kolesnikova et al. (2021:34) finding that participants were less likely to focus on the lecture material when the speaker had a foreign accent because they couldn't make an attempt to learn the phonological peculiarities of the lecturer's speech.

Some participants struggled with the language of the course (jargon), as seen here where respondents expressed their feelings:

“But then they throw in Latin”.

Law of Contracts FG

Another participant from the same focus group said:

“When they use big words”.

Law of Contracts FG

Law of Contract participants seem to struggle with jargon in this subject, which could potentially affect the level of understanding of the course content in a negative way.

The substitution of jargon with layperson language or, where possible, terms, may be a solution to understanding course content in such a case. In a study by McDonnell et al. (2016:18) the researchers found that the substitution of jargon with everyday terms and phrases can significantly improve student understanding of course material.

4.3.4 Negative attitudes towards, and perceptions of, multilingual glossaries

This theme highlights respondents’ negative opinions of, and insights into, the content of the multilingual glossaries. One participant posed a question regarding the limited languages in the Law of Contract glossary as follows:

“Out of all the languages here, why do you have only Afrikaans and isiXhosa qha?”

Law of Contracts FG

Another participant from the same focus group said:

“If we do attempt to write a test, it will be difficult to actually translate the language that you have studied in back to English, so I don’t like that, I don’t like the ideas of the whole thing.”

Law of Contracts FG

Participants voiced their concerns about the limited number of languages represented in the multilingual glossaries, which currently have the three official regional languages of the Western Cape (Afrikaans, English, and isiXhosa). It was a deliberate decision for this research project, as a starting point, to represent the steadily growing and even current majority of languages spoken by the student community enrolled at CPUT. Figure 12 illustrates the year enrolments by cultural groups at CPUT:

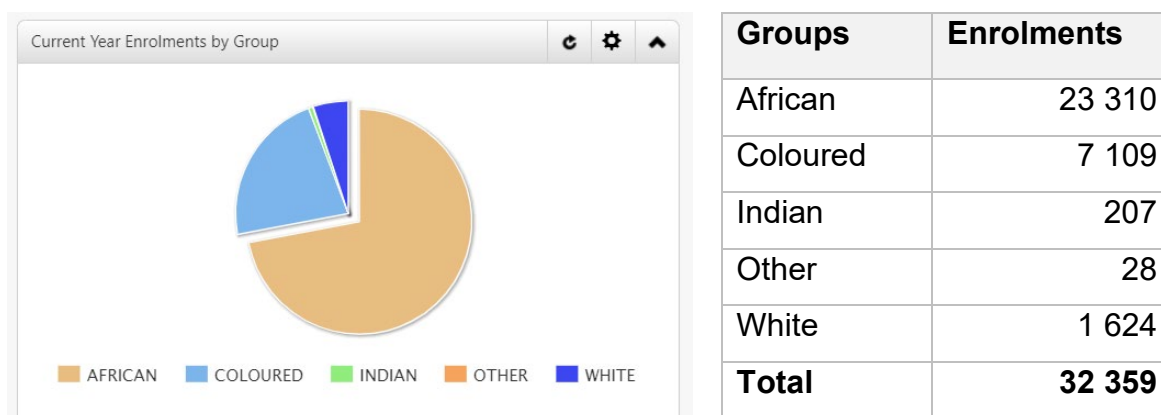


Figure 12: Current year enrolments by group at CPUT (CPUT HEDA, 2017)

While some participants have recommended the use of the online multilingual glossaries citing that it is convenient, simple and saves time, the following quote shows that a participant disagrees with this view, saying the platform is time consuming, destructive and confusing:

“Firstly its time consuming, a lot of distraction and confusion will take place at the same time, so I’m saying no”.

Horticulture 1 and Plant Material Studies FG

4.3.5 Negative attitudes towards, and perceptions of, mother tongue

This theme highlights participants’ opinions and insights on the challenges associated with the use of mother tongue instruction alongside English in the teaching and learning of concepts in their courses. A participant expressed their opinion about this as follows:

“Personally, I feel that using, for example, a native tongue like isiXhosa will be difficult, because some words are not in the vocabulary of the Xhosa language”

Foundation of Nursing Practice FG

Another participant shared an opinion on translation:

“I would also disagree because sometimes when someone translates what you are saying, for example isiXhosa is very direct, when I translate isiXhosa directly into English, and then what I’m saying doesn’t make sense. So I don’t

think having someone teaching me in English and have it translated in isiXhosa will make sense, it just confuse me”.

Law of Contracts FG

It is evident from the above quotes that these respondents are worried about the inadequate academic concepts or terminologies in isiXhosa, and the authenticity of translations of isiXhosa into the English language.

One of the ways that we ensure the accessibility (simplicity) of the language of the multilingual glossaries at CPUT is by honouring the voice and inputs of the students in all our verification processes.

Carstens (1998:4) argues that, for South Africa to develop, literacy in the mother tongues of the people must first be developed, as this will help them in developing skills in scientific and technical fields.

Using one’s primary language during the learning process is crucial to success as it provides access to knowledge presented in another language, laying the foundation for understanding (Madiba, 2010).

Several authors further express their support for facilitating mother-tongue education up to secondary and tertiary level (Prah, 1995; Mohapi,1997:75; Mthembu, 1997:99), while Bekeweni (1997: 94) express skepticism over the feasibility thereof in terms of the time and cost involved. Maseko (2010) also supports these sentiments by stating that many scholars (Caterns, 1999; Msimang, 2000; Mphahlele, 2004; Van der Walt & Fourie 2005) have recently urged for and demonstrated the feasibility of the terminologisation of indigenous African languages to support teaching and learning in subjects such as Science.

4.3.6 Positive attitudes towards, and perceptions of, mother tongue

This theme highlights respondents’ points of view on, and insights into, the use of mother tongue for better understanding of their course content. A participant expressed their experience:

“From experience, in high school I was taught in English but with isiXhosa at the same time. So your teacher will tell you in English and explain in Xhosa and we would understand better”.

Foundation of Nursing Practice FG

Another participant said:

“Learning using your mother tongue, I guess it helps, it does help at some point because that’s the language you are familiar with, that’s how you get to understand most of the things”.

Horticulture 1 and Plant Material Studies FG

Several researchers, such as Kharma and Hajjaj (2009: 223 - 252), attest to the fact that learning using mother tongue is beneficial to the learner. When the medium of instruction is the native language, a child learns concepts faster, adjusts more effectively, and shows faster gains in learning.

In a study on mother tongue as the medium of instruction in developing country universities in a global context, Nyika (2015:2) found that students whose mother tongue is used as the language of instruction at their universities have an advantage over students whose mother tongue is not the language of instruction at their universities.

A participant shared their insight on the benefit of using isiXhosa in class:

“For instance now we just had an assignment and the question was asked, we would read the content and then we explained in isiXhosa for the rest, but we would read it ok, and that’s what it says and say ok so mamela ke i-suspence yile, na le, na le, and then ke you write it in English but I said to you in isiXhosa”.

Law of Contracts FG

This theme also revealed that some respondents learnt and improved their knowledge of other languages through the different languages represented in the multilingual glossary: This participant expressed how they related to the languages in the glossary:

“And also, when I went through the glossary, I found that some terminology, since I can speak all three languages Xhosa, Afrikaans and English I found it very nice. Because I could relate in Afrikaans that ok what this word is. Now I understand it better in Xhosa”.

Foundation of Nursing Practice FG

4.3.7 Positive attitudes towards, and perceptions of, multilingual glossaries

This theme highlights respondents’ opinions and insights on the use of the multilingual glossaries platform. A participant shared their opinion as follows:

“There is something helpful in the glossary because I remember for Plant ID and also for PMS, I used to go there to search for words like abrasion, and the processes, so there they explain it to you in isiXhosa and there you can understand and relate, so it makes it easier for you to study and in the exam it’s not that difficult, you just know that ok you have learned it in isiXhosa before”.

Horticulture 1 and Plant Material Studies FG

A participant emphasized the simplicity of isiXhosa content in the glossary when they said:

“It’s easy to understand kum, because akukho maqala akukho zanqhi, like eve if you are not Xhosa you can understand that Xhosa”.

Law of Contracts FG

Participants were asked if they preferred additional multilingual learning materials in other formats additional to text only. This is how some responded:

“Pictures, when something is explained and there is a picture of it”.

Law of Contracts FG

A Horticulture participant expressed their preference as follows:

“I prefer videos, because the one thing that frustrates me is when I can’t understand something, and still in my mind I can’t imagine what you are trying to tell me”.

Another participant, from Nursing this time, said:

“I am a visual person so I study with pictures”.

A participant from Law of Contract also contributed as follows:

“Yes, things like illustrations, something like sabu-sketch”.

Jiao and Chen (2011) define multimedia as a combination of text, graphics, art, sound, animation and video, with links and tools that let the teacher/learner navigate, interact and communicate with the computer. The use of hyperlinks, audio, pictures and videos can “expand the words making readers more attracted by the words and become more actively involved in the learning process” (Jiao & Chen, 2011:591).

All CPUT multilingual glossaries already have multilingual audio voiceover integrated with the relative concepts. One glossary has illustrations provided by students enrolled for that subject. None of the current glossaries have videos yet. While multimedia can offer layers of beneficial resources and an abundance of information, multimedia can, however, become disadvantageous when an overwhelming flood of information make learners feel frustrated and helpless. Generally, multimedia facilitates easy learning for people because it appeals more readily to those with diverse leaning preferences (Jiao & Chen, 2011:592).

4.3.8 Suggestions for multilingual glossaries improvement

This theme highlights respondents’ recommendations for the multilingual glossaries platform. The respondents’ suggestions range from including more multimedia and social elements, to representing the sounds and other phenomena of speech.

A participant from Law of Contract said:

“I think there should be like a chat thingy like a chat box, where you have a question at that moment, you ask and there is an automatic answering or either if I was on the side I would be able to assist”.

A participant expressed what they thought could be added to the multilingual glossaries platform:

“I think videos would come in to play, because you get some videos, because sometimes you have the actual lecturer playing some videos to make you understand while watching the video”.

Horticulture 1 And Plant Material Studies FG

Another participant from the same focus group discussion said:

“They can emphasize it on Blackboard. Yes, because Blackboard is basically all about notes and announcements, while this one is basically the one that should be there”.

Horticulture 1 and Plant Material Studies FG

A few of the Law of Contract participants mentioned the following additions they would like to see on the multilingual glossaries platform:

“Also in the illustrations, it would be nice for a blind person to have some description of what is in the illustration”.

Law of Contracts FG

“Like how to learn words, you know like under the English one, how to pronounce words using phonetics like in the dictionary.

Law of Contracts FG

“For them to write your name and say you contributed things like that nton – nton”.

Law of Contracts FG

“So, video. Visual will also be a very good thing because sometimes hearing something, now you put a picture to it, you see? So that way you understand it better as well”.

Law of Contracts FG

“Does it have Facebook page? I think they should add that”.

Law of Contracts FG

A participant from Nursing suggested adding some fun elements to the platform as follows:

“I think it could have a little app. I don’t know if you know what I mean. Like an app on your phone. Even if it is not like a game. Just kind of have fun with it”.

Foundation of Nursing Practice FG

Initially a conscious decision was made to not link popular social media applications like Facebook or Twitter to the multilingual glossaries to restrict distractions that might take away from the academic multilingual concepts on the platform. However, the CPUT online multilingual glossaries platform does have custom social functions that allow the users to create groups of interests to connect with each other and/or to discuss particular concepts or other interests in the glossaries of their choice. This tool was also created with the intention to encourage the users to engage and interact with each other personally and ultimately to create a sustainable sense of belonging and ownership of the glossaries in their study fields.

Other researchers have also found that students can use technology tools to adapt to their different learning styles, and social media applications offer a variety of tools that learners can use to suit their learning styles and enhance their academic success (Raut & Patil, 2016).

4.4 Lecturer questionnaire

Subject lecturers provided secondary data to the study by giving their opinions about the multilingual glossaries through a questionnaire that the researcher had prepared especially for them. The lecturers’ responses confirmed that their view that most students have language challenges that affect learning of academic concepts, especially students whose first language is not English. Lecturers agreed that language plays a role in understanding academic concepts, mentioning the importance of mastering the professional language of their relative study fields.

The study found that lecturers used the multilingual glossaries in class for different teaching and learning activities. Students were encouraged to use the multilingual glossaries and the platform; however, a lecturer mentioned that some students did not want to visit the platform because they preferred more interactive content, such as videos.

The consensus among lecturers is that the multilingual glossaries improve understanding and therefore increase self-confidence; they also promote engagement that supports learning. Lecturers would like more collaborative work, multimedia elements and more concepts to contribute and improve the multilingual glossaries and its platform. The following table shows questionnaire responses from lecturers:

Table 5: Responses from lecturer questionnaires

Question	Foundation of Nursing Practice Lecturer response	Horticulture 1 and Plant Material Studies Lecturer response	Law of Contracts Lecturer response
1. Do your students have any language challenges? Please elaborate.	<i>“Yes. Some students who are not English speakers as the first language struggle to understand their course content as the medium of instruction is English and subject guides and learning material is in English.”</i>	<i>“Yes because English is not their first language.”</i>	<i>“Yes they do. Many of them do not have English as their First Language and lectures are conducted solely in English. Students who have English as their first language tend to grasp concepts easier. This is based on anecdotal evidence and I have no proof of this. It is just my</i>

Question	Foundation of Nursing Practice Lecturer response	Horticulture 1 and Plant Material Studies Lecturer response	Law of Contracts Lecturer response
			<i>experience in the class.”</i>
2. Do you think language plays a role in understanding academic concepts?	<i>“Yes, very much.”</i>	<i>“Horticulture has its own vocabulary, the way in which one talks in Horticulture is different from the plain or simple English.”</i>	<i>“Yes I do. ...”</i>
3. Would you use multilingual practices during your lecture? If yes, how would you use them?	<i>“Yes for clarifying certain concepts as well allowing students to try and answer in their language during interactive lectures to ascertain if they understand and assist to translate it back to English.”</i>	<i>“Yes, I would use them by giving illustrations and drawings.”</i>	<i>“Yes we have. We piloted the multilingual tutorial programme in the subject of Commercial Law 1 on the Cape Town campus to great success. We employed tutors who spoke different languages and students were able to attend tutorials in their mother tongue. We</i>

Question	Foundation of Nursing Practice Lecturer response	Horticulture 1 and Plant Material Studies Lecturer response	Law of Contracts Lecturer response
			<i>also collaborated with the language unit to conduct these tutorials.”</i>
4. Do you encourage the use of multilingual glossaries during your contact time with students? If yes, Please elaborate.	“Yes”	<i>“I do but they don’t seem to be keen to visit more often because for students it’s easy to understand content on pictures or videos than words only.”</i>	<i>“We aim to be as inclusive as possible with our lectures and thus we have developed our glossaries a few years back, now expanding on them recently for the benefit of our B Paralegal students as well.”</i>
5. In your opinion what is the impact of the online multilingual glossaries on the academic experiences of your students?	<i>“They enhance the understanding and therefore improve confidence and foster engagement which assists learning to take place”</i>	<i>“Supporting students in their language development will foster independence in the long run. I believe where there is an understanding there is usually more of a focus on</i>	<i>“It is imperative for the students to be familiar with the terms and concepts when speaking about them in class as they would be lost without the proper understanding of the terms and</i>

Question	Foundation of Nursing Practice Lecturer response	Horticulture 1 and Plant Material Studies Lecturer response	Law of Contracts Lecturer response
		<i>critical thinking and learning.”</i>	<i>concepts we talk about in class.”</i>
6. Given an opportunity, how would you contribute to the CPUT online multilingual glossaries?	<i>“Collaboration and engagement in fields of knowledge and language that I am familiar with if I am allowed since I am no longer with CPUT fraternity but I was involved in the development of Foundation of Nursing Practice.”</i>	<i>“Add pictures or drawing and also videos.”</i>	<i>“We have compiled lists of terms for translation for 2 of our subjects and hope to increase them in the future.”</i>

4.5 Student questionnaires

The student questionnaire consisted of two sections: the first section looked into answering the question about the accessibility of the language of the glossaries, while the later section looked into bringing insight into the impact of the multilingual glossaries platform on the academic experience of the respondents.

In the next section, the collected data is represented separately relative to each case (subject). Graphs and narratives are used to present the collected data, with an analysis following below the graphs.

4.5.1 Foundation of Nursing Practice

4.5.1.1 How did you get to know about CPUT online multilingual glossaries?

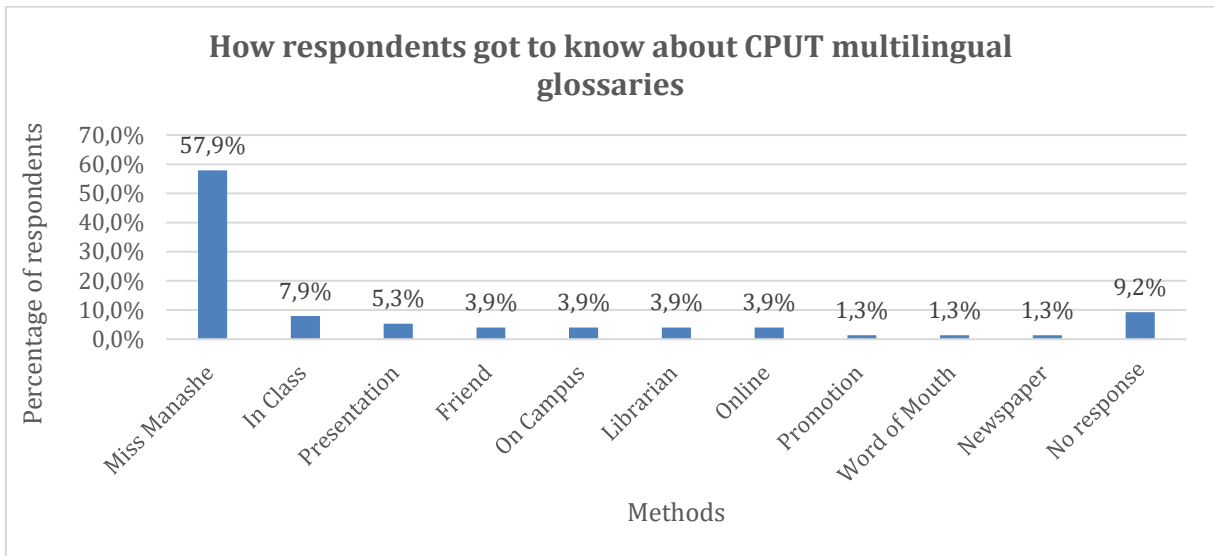


Figure 13: How respondents learned about the multilingual glossaries (MLG) at CPUT

In response to the question, 57.9% of the participants indicated that they got to know about the CPUT multilingual glossaries from the researcher. Other mentioned sources were: 'in class' (7.9%); 'presentation' (5.3%); and 3.9% of the respondents mentioned 'friend', 'campus', 'library', and 'online' respectively; and 1.3% of the respondents mentioned 'promotion', 'word of mouth' and 'newspapers' respectively. Finally, 9.2% of the participants did not respond to this question.

4.5.1.2 How easy was it to access the CPUT online multilingual glossaries website?

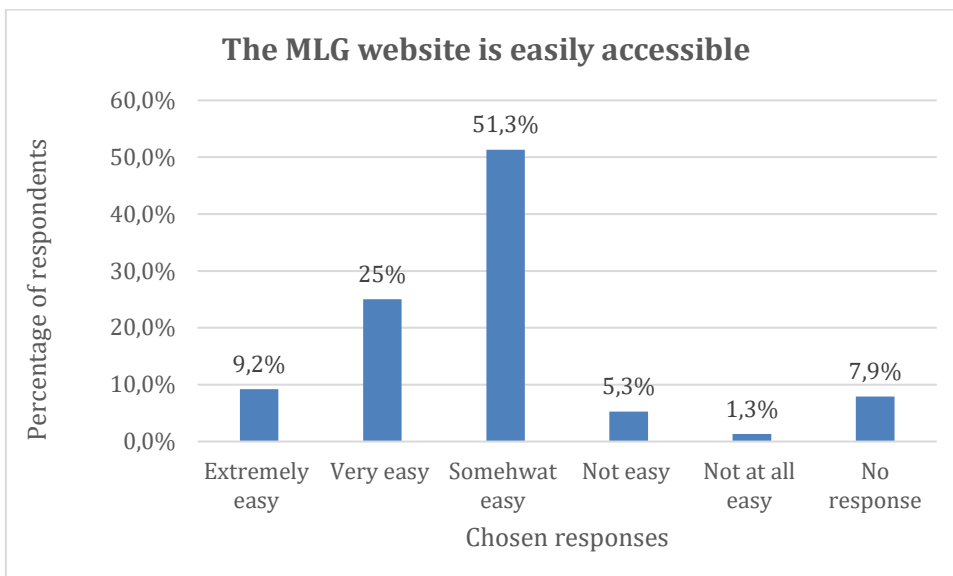


Figure 14: MLG website accessibility

According to this graph, the majority (51.3%) of the respondents found the multilingual glossaries website somewhat easily accessible, however it is clear from the 25% and 9.2 % that many students found it very or extremely easy to use. Only 7.9% did not respond to this question, while there were comparatively very few (a total of 6.6%) students who struggled a little to access the multilingual glossaries, the researcher does not know the factors contributing to the non-accessibility.

4.5.1.3 We are given time to use the online multilingual glossaries website in our course programme

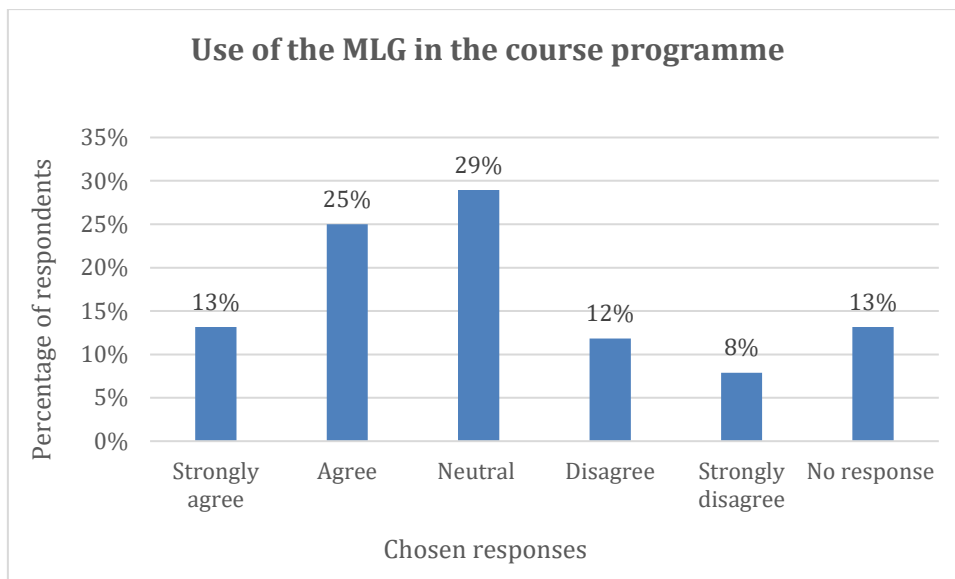


Figure 15: The use of MLG in the Foundation of Nursing Practice course programme

This graph indicates that a total of 38% of the responses was positive to some extent when they agreed or strongly agreed to have been given time to use the online multilingual glossaries in the Foundation of Nursing Practice course. Neutral was selected by 29% of the respondents. Research has shown that the option of a neutral response allowed people who had no opinion or no interest in a subject such as religion to select a neutral response instead of having to select one that did not reflect their true beliefs (Krosnick et al., 2002; Johns, 2005). Only 20% of the respondents disagreed or strongly disagreed with the statement that they were given time to use the multilingual glossaries in their course programme. Lastly 13% of the participants did not respond to this statement.

4.5.1.4 It was easy to find my subject on the online multilingual glossary website

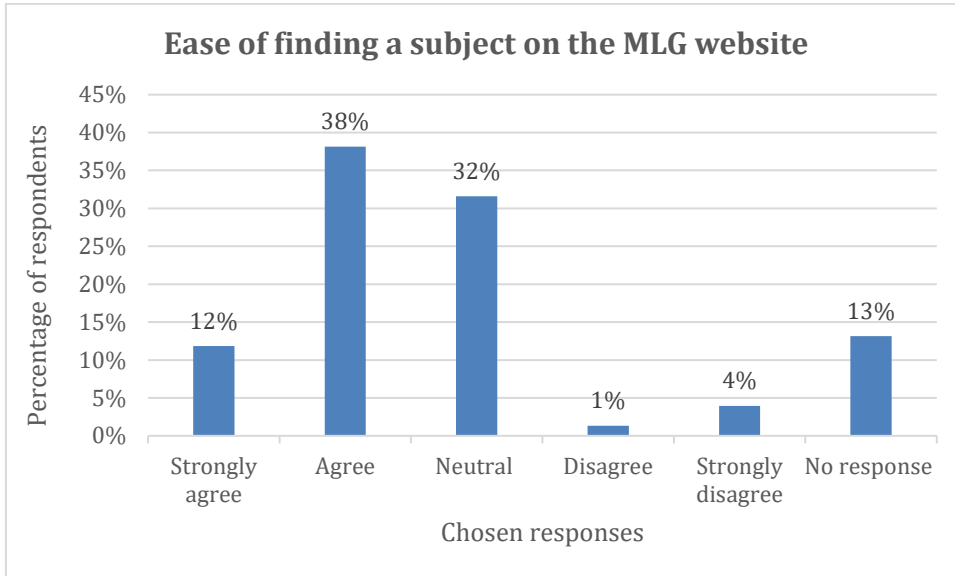


Figure 16: Ease of finding a subject on the MLG website

Of the respondents, a total of 50% agreed or strongly agreed that it was easy for them to find their subject on the CPUT online multilingual glossaries website. This graph also shows 32% of the respondents to have selected the neutral option, while only a total of 5% of the respondents disagree or strongly disagree with the statement. Finally 13% chose not to respond.

4.5.1.5 The CPUT online multilingual website looks appealing to me

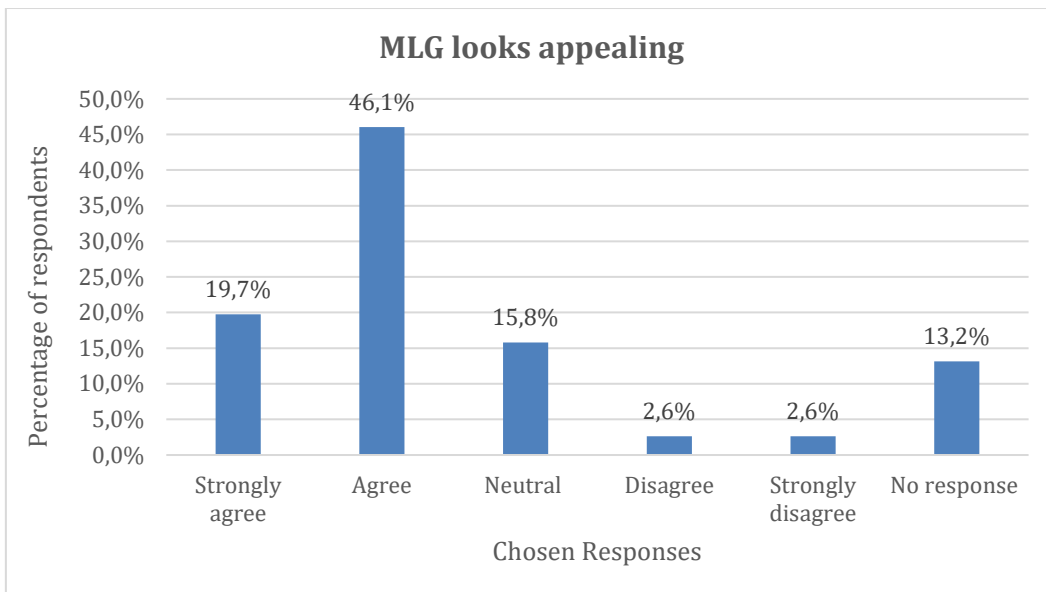


Figure 17: MLG website appeal

Over 65% of the respondents agreed or strongly agreed that the multilingual glossaries website was appealing; of the respondents 15% chose the neutral option; only a total of 5.2% disagree or strongly disagree with the statement; There was no response from 13.2% of the participants.

4.5.1.6 I was able to access the multilingual glossaries website when I was not on campus

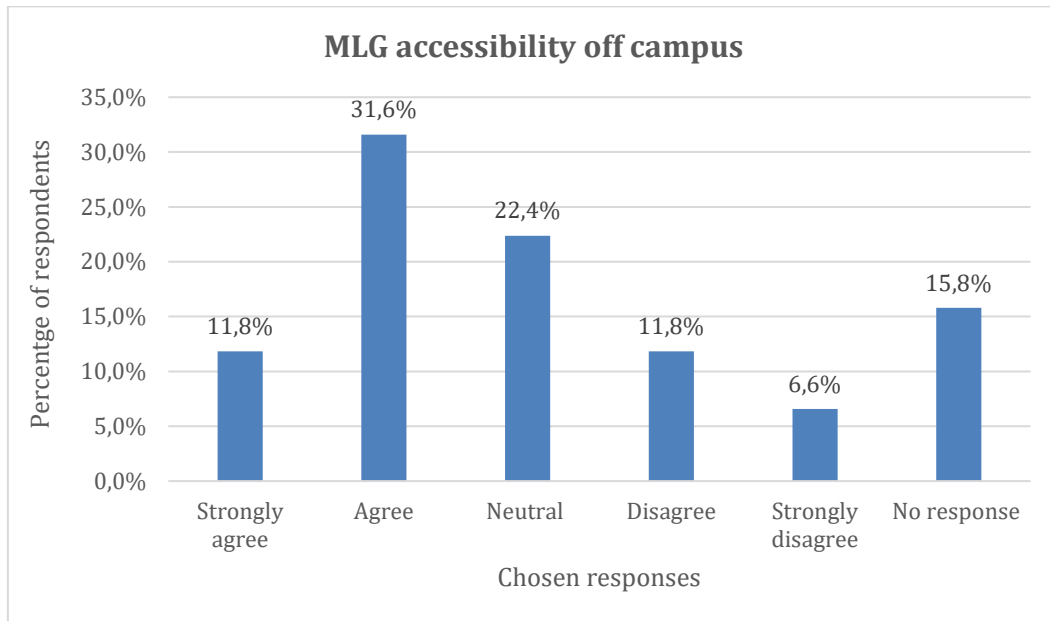


Figure 18: MLG website accessibility off campus

Of the respondents, 43.4% agreed or strongly agreed that they had access to the online multilingual glossaries website even when not on campus. The next significantly high percentage (22.4%) is that of the participants who chose the neutral option. Following close is the 18.4% who disagreed or strongly disagreed, while 15.8% did not respond to this statement.

4.5.1.7 The level of the isiXhosa language used in the glossaries is understandable

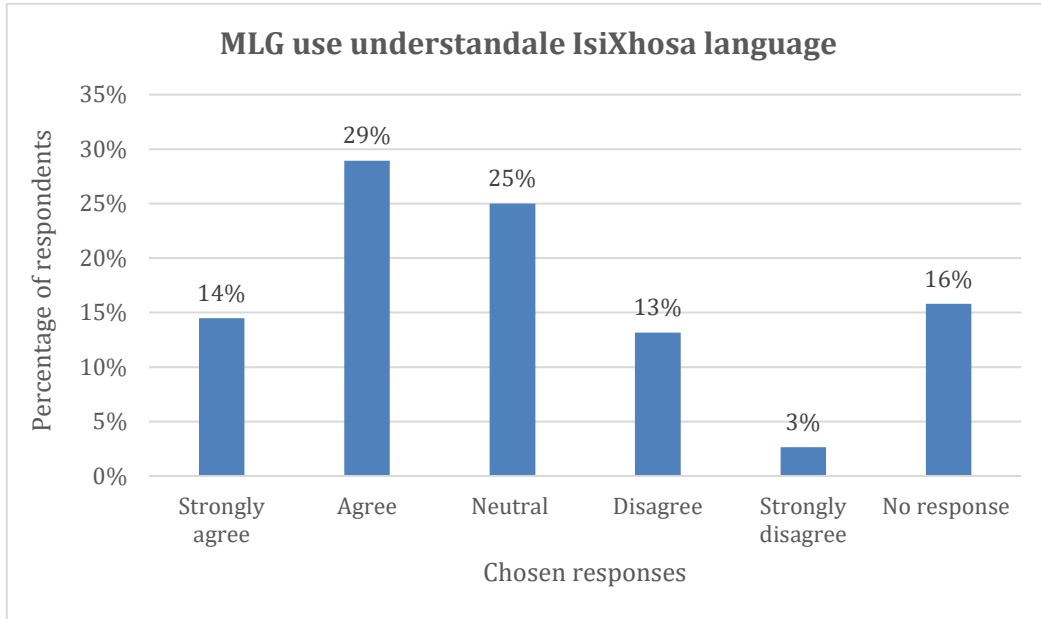


Figure 19: IsiXhosa language's level of understandability in the MLG

According to 43% of the respondents who agreed or strongly agreed, the level or simplicity of IsiXhosa language in the CPUT multilingual glossaries was understandable; followed by 25% of the respondents who chose the neutral option; a total of 16% of respondents disagreed or strongly disagreed with this statement; and another 16% of the respondents did not respond to this statement.

4.5.1.8 The level of the Afrikaans language used in the glossaries is understandable

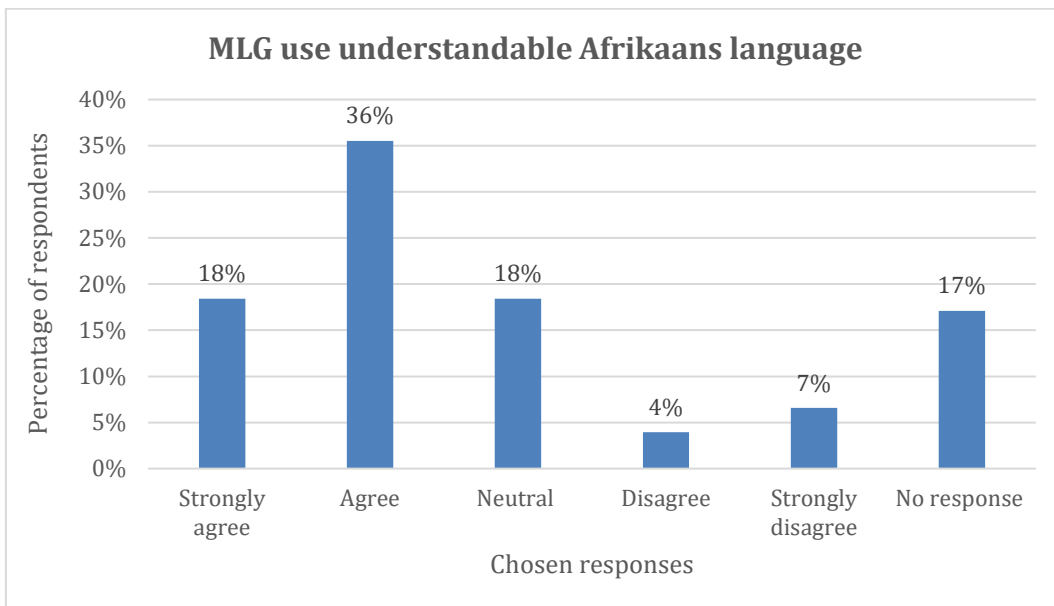


Figure 20: Afrikaans language's level of understandability in the MLG

Of the respondents, the majority (54%) agreed or strongly agreed that the level or simplicity of the Afrikaans language in the CPUT multilingual glossaries was understandable; 18% of the respondents chose the neutral response; 17% did not respond to this statement ; lastly, only 11% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.9 The level of the English language used in the glossaries is understandable

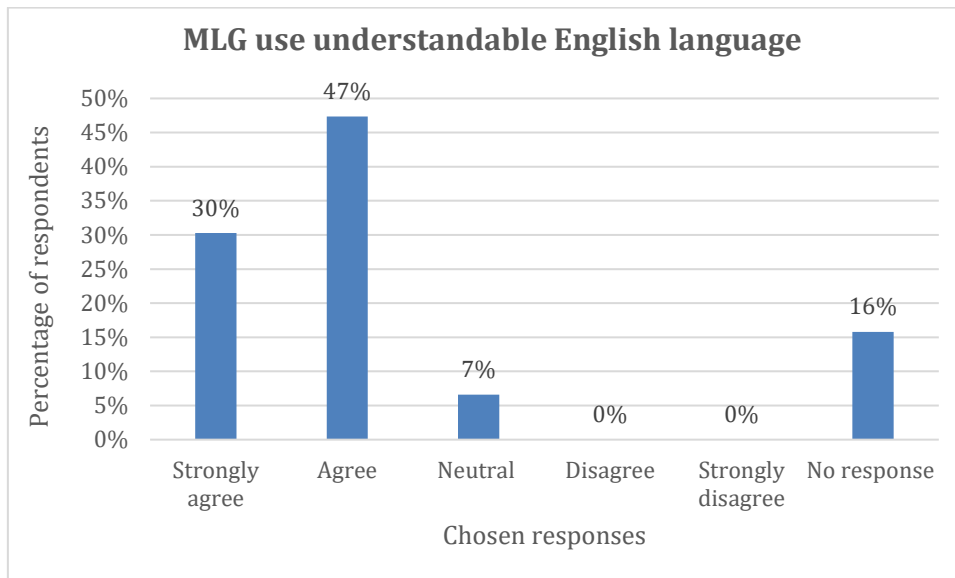


Figure 21: English language's level of understandability in the MLG

In the view of 77% of the respondents who agreed or strongly agreed, the level or simplicity of the English language in the CPUT multilingual glossaries was understandable; 16% of the participants did not respond to this statement; only 7% of the respondents selected the neutral response; and 0% respondents disagreed or strongly disagreed with this statement.

4.5.1.10 I would recommend the use of African languages in higher education

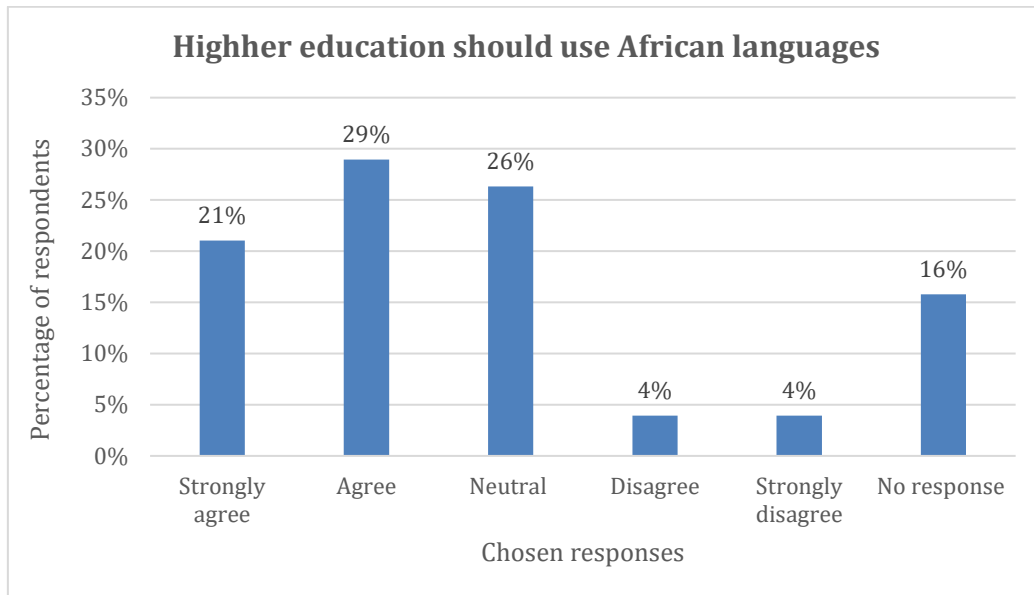


Figure 22: The use of African languages in higher education

Of the respondents, 50% recommended the use of African languages in higher education; followed by 26% who responded neutral; 16% of participants did not respond; and only 8% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.11 I have to translate English content into a language I better understand when I study or during lectures

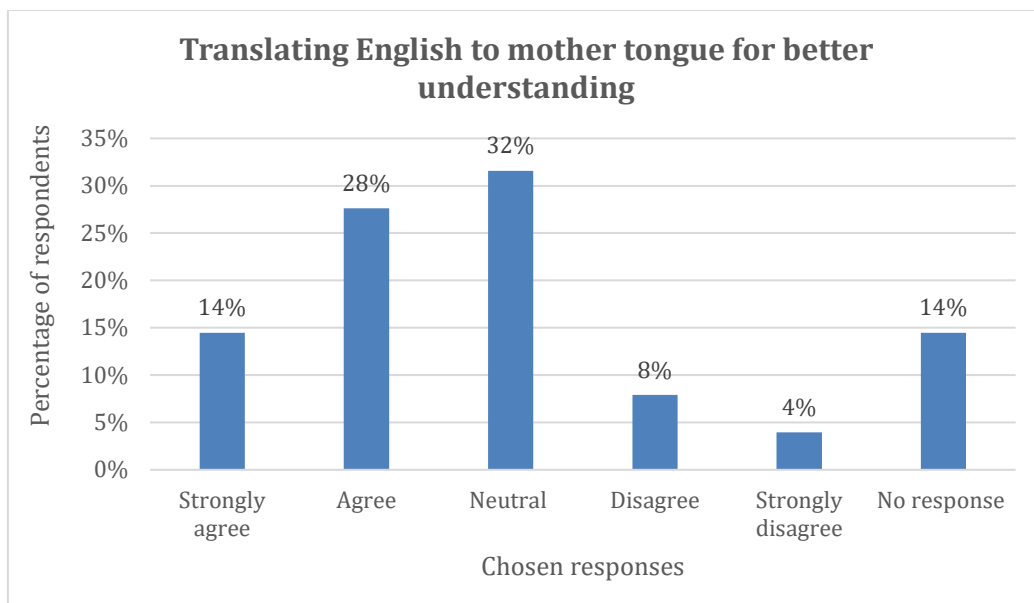


Figure 23: Translation of English to mother tongue for better understanding

Fourthly-two (42%) of the respondents agreed or strongly agreed that they translate English to mother tongue to understand their course content better; 32% of respondents chose the neutral option; 14% of the participants did not respond to this statement; only 12% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.12 I understand course material better when I hear it

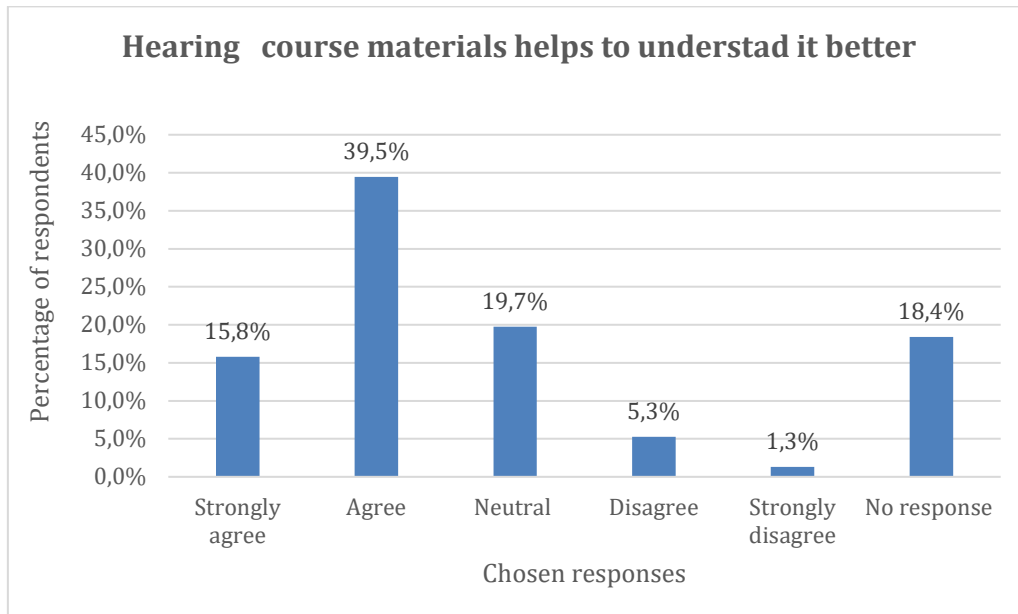


Figure 24: Hearing course materials helps with better understanding

In the opinion of 55.3% respondents who agreed or strongly agreed to this statement, their understanding of the course content was better when they heard it which referred to using audio material to study. 19.7% responded neutral to this statement, while 18.4 chose not to respond; only 6.6% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.13 I understand course material better when I see it

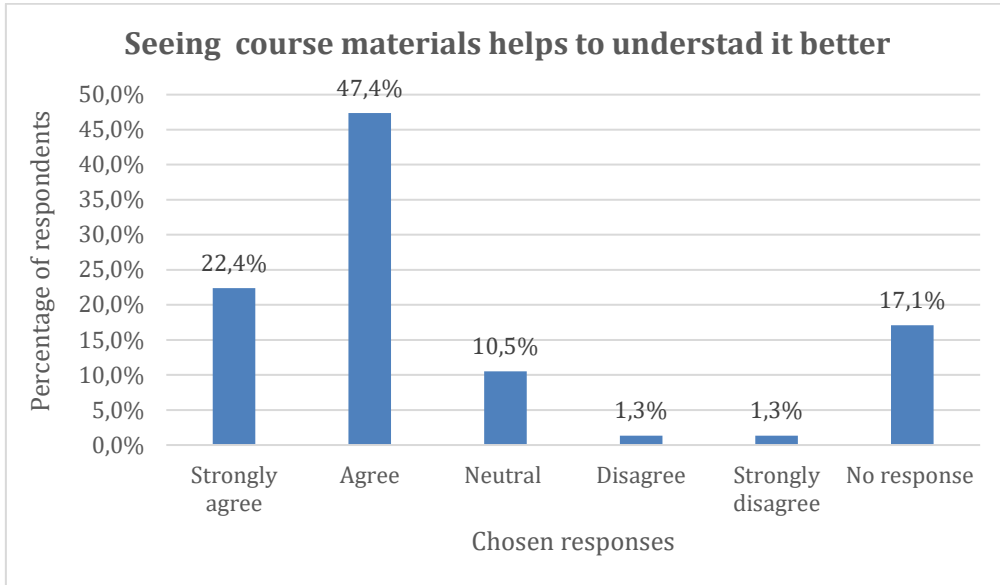


Figure 25: Seeing course materials helps with better understanding

Of the respondents, the majority 69.8% agreed or strongly agreed that they understood their course content better when they see it, referring to using visuals when they study; 17.1% of the respondents did not answer to this statement; 10.5% of the respondents chose neutral, while only 2.6% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.14 I understand course material better when I read it

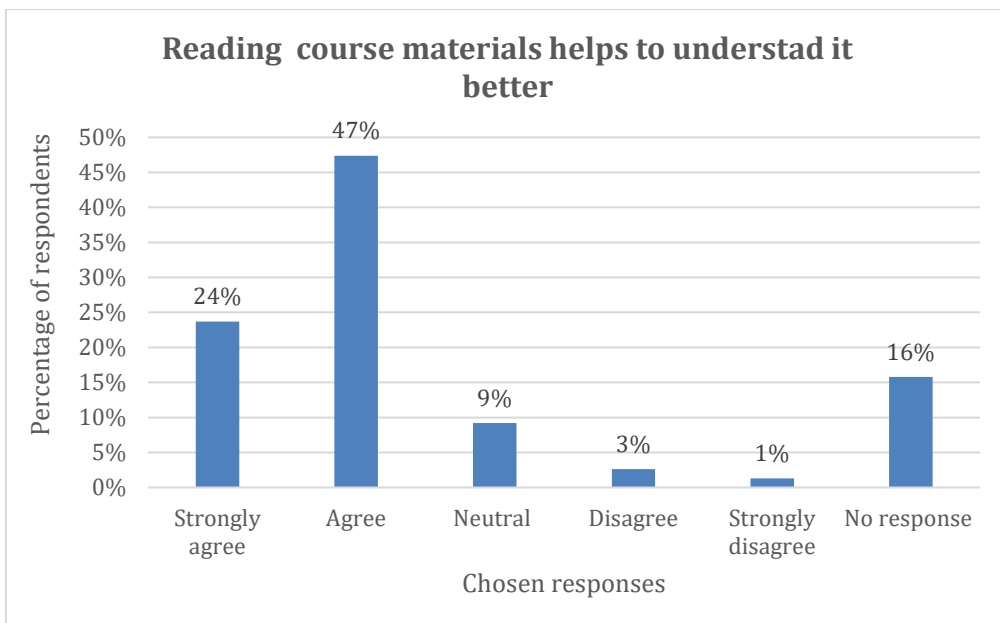


Figure 26: Reading course materials helps with better understanding

It was the view of the majority (71%) of the respondents who agreed or strongly agreed, that they understood their course content better when they read it; 16% did not respond to this statement; only 9% of the respondents selected neutral; and lastly just 4% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.15 I would prefer additional learning resources in my home language

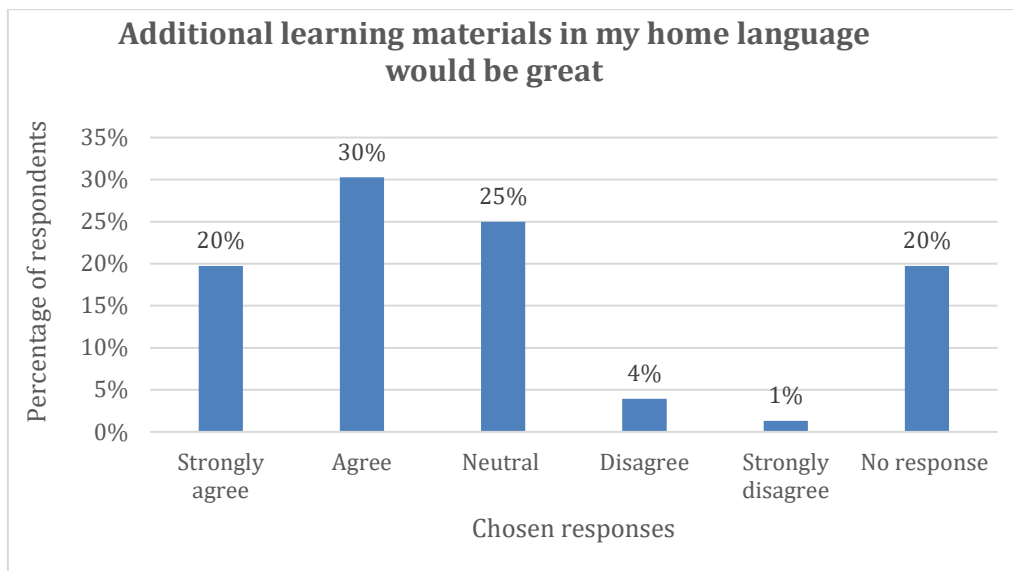


Figure 27: Preference for learning materials in a home language

It seems that 50% of the respondents would have preferred additional learning resources in their mother tongue; followed by 25% of the respondents who selected neutral; while 20% did not respond to this statement; only 5% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.16 I am concerned about understanding my course content

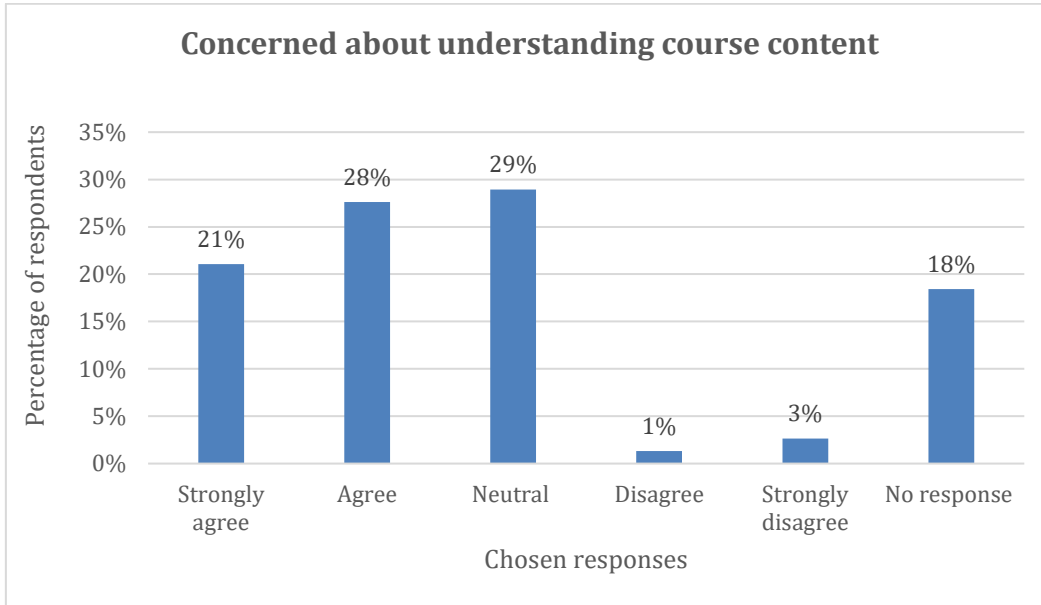


Figure 28: Concern about understanding course content

Fourthly-nine (49%) of the respondents agreed or strongly agreed that they were concerned about understanding their course content; followed by 29% of the respondents who chose the neutral option; of the respondents 18% did not respond to this statement, and only 4% of the respondents disagreed or strongly disagreed with this statement.

4.5.1.17 How often do you use the website?

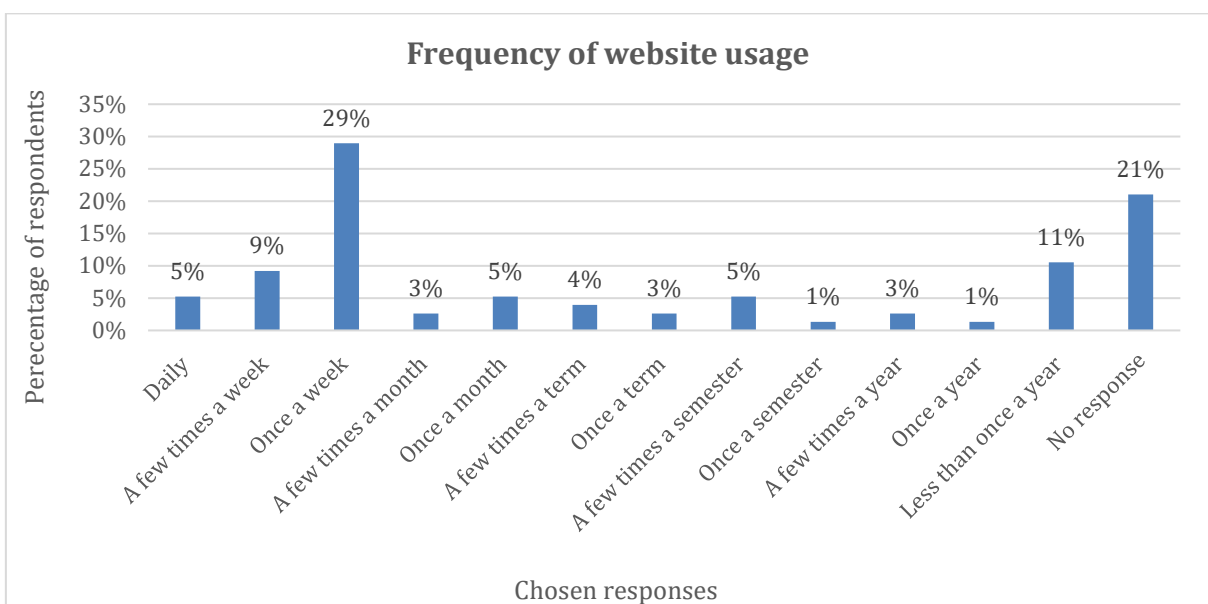


Figure 29: Frequency of using the MLG website

Of the total number of respondents who used or visited the multilingual glossaries website 29% visited at least once a week; 21% of the participants did not respond to this question. The other responses to this question were as follows: less than once a year (11%); a few times a week (9%); daily (5%); once a month (5%); a few times a semester (5%); a few times a term (4%); a few times a month (3%); once a term (3%); a few times a year (3%); once a semester (1%); and once a year (1%).

4.5.2 Horticulture 1 and Plant Material Studies

4.5.2.1 How did you get to know about CPUT online multilingual glossaries?

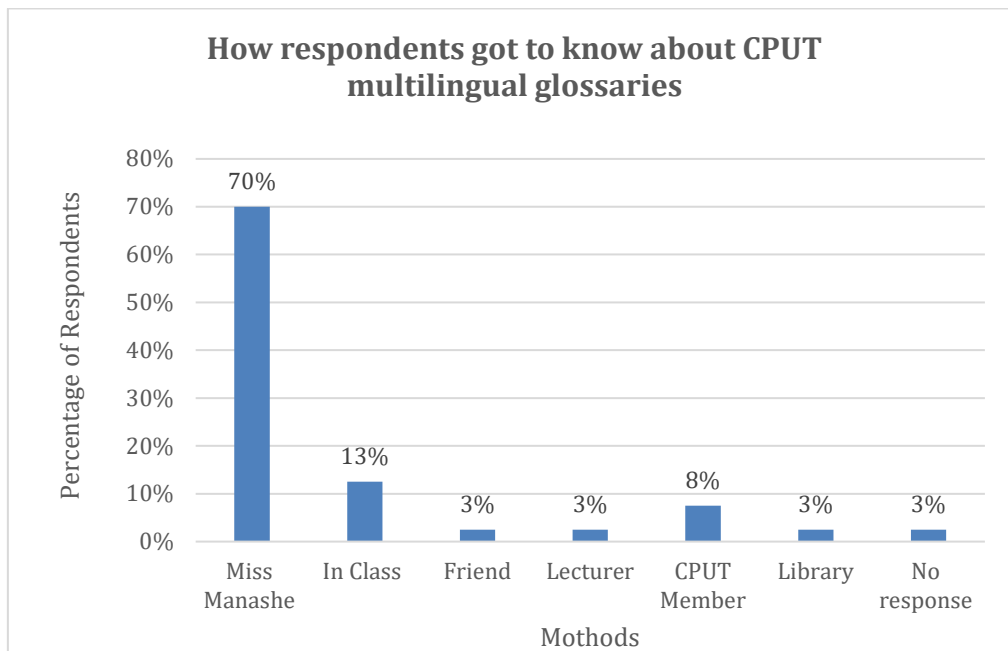


Figure 30: How respondents learned about the multilingual glossaries at CPUT

Clearly the majority, 70% of the respondents, indicated that they got to know about the CPUT online multilingual glossaries from the researcher; while the rest of the responses were as follows: in class (13%); CPUT member (8%); friend (3%); lecturer (3%); library (3%); and there were no responses from 3% of the participants.

4.5.2.2 Is the online multilingual glossaries website is easily accessible to you?

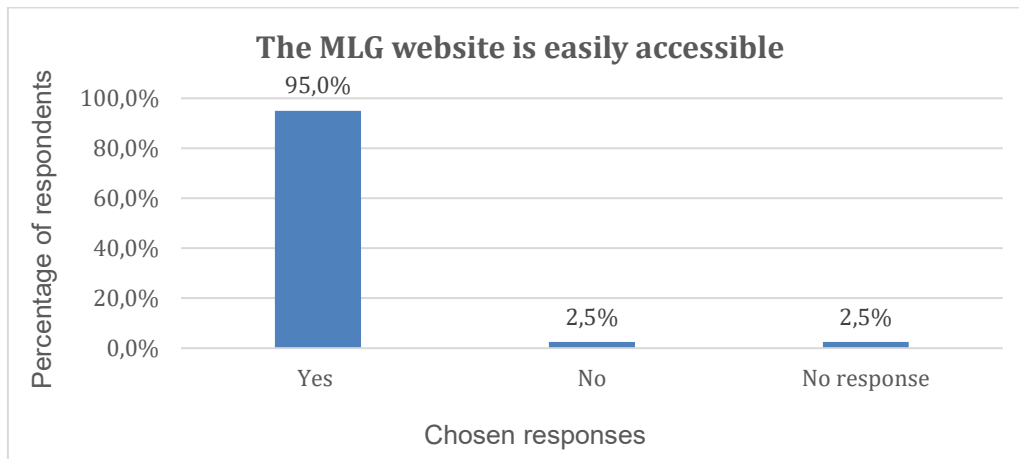


Figure 31: Multilingual glossaries website accessibility for Horticulture 1 and Plant Material Studies

By far the majority (95%) of respondents chose 'Yes', indicating that the multilingual glossaries website was easily accessible; only 2.5% selected 'No' in disagreement with this statement; and another 2.5% did not respond to this question.

4.5.2.3 What was useful to you on the online multilingual glossaries' website?

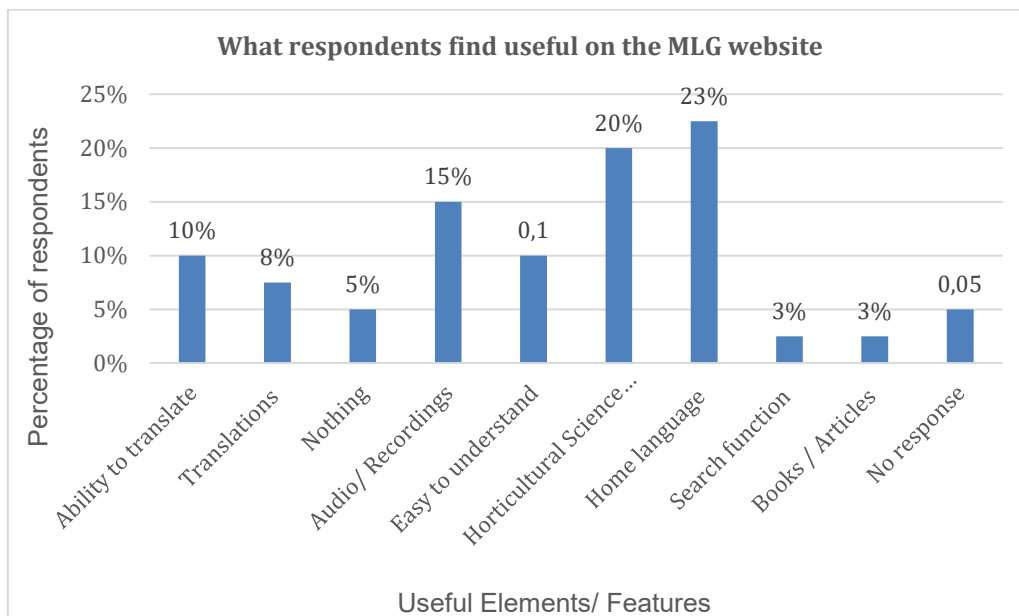


Figure 32: What respondents found useful on the MLG website

It transpired that home language was found most useful in the multilingual glossaries website by 23% of the respondents; followed by 20% which is Horticultural Science concepts. Other useful elements of the MLG website were deemed as follows: audio or recordings (15%); ability to translate (10%); translations (8%); nothing (5%); search

function (3%); books or articles (3%); ease to understand (0.1%) and those who did not respond were significantly less (0.05%).

4.5.2.4 What did you like most about the online multilingual glossaries website?

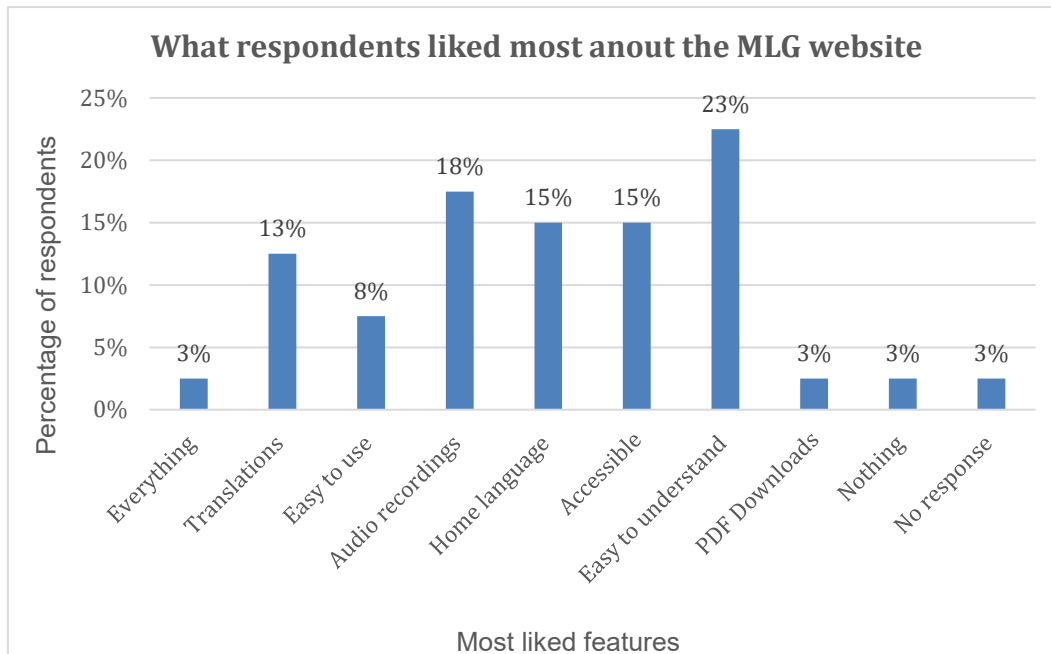


Figure 33: What respondents liked most about the MLG website

The most commonly mentioned response (23%) came from respondents who said what they liked most about the online multilingual glossaries website because it was “easy to understand”; closely followed 18% of the respondents who said it was audio recordings. The other elements that the respondents liked about the online multilingual glossaries website were as follows: home language (15%); accessibility (15%); translations (13%); easy to use (8%); PDF downloads (15%). Surprisingly an equal number of respondents (3%) said they liked “everything” while another 3% said they liked “nothing”. Lastly 3% did not respond to this question.

4.5.2.5 What did you like least about the online multilingual glossaries website?

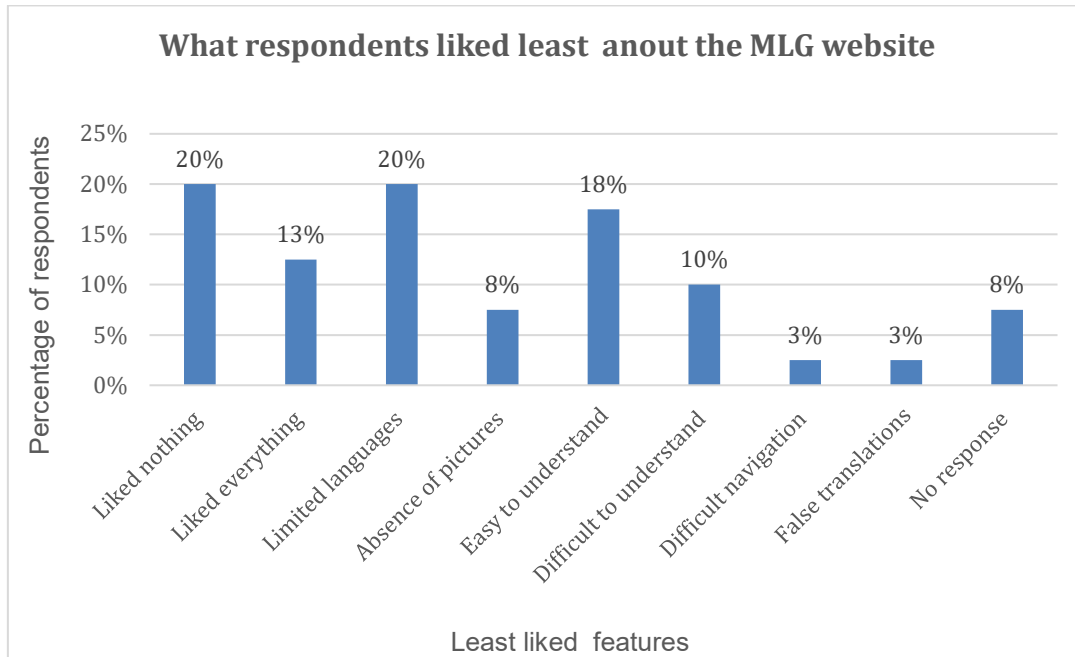


Figure 34: What respondents liked least about the MLG website

Some of the responses to this question did not match the question, the researcher is not clear about the reason of this result. Of the respondents, 20% indicated equally that they “liked nothing” and “limited languages” in response to the question. Eighteen (18%) of the participants indicated that “easy to understand” is what they liked least about the multilingual glossaries website. When asked what they like least about the multilingual glossaries website, 13% respondents said they “liked everything.” Ten (10%) of the respondents mentioned “difficult to understand” as what they liked least. The “absence of pictures”, is what 8% of the respondents like least about the multilingual glossaries website. There were no responses from 8% of the participants. An equal number (3%) of respondents said what they liked least about the multilingual glossaries website was “difficult navigation” and “false translations”.

4.5.2.6 What can be added or be removed from the current CPUT multilingual glossaries website?

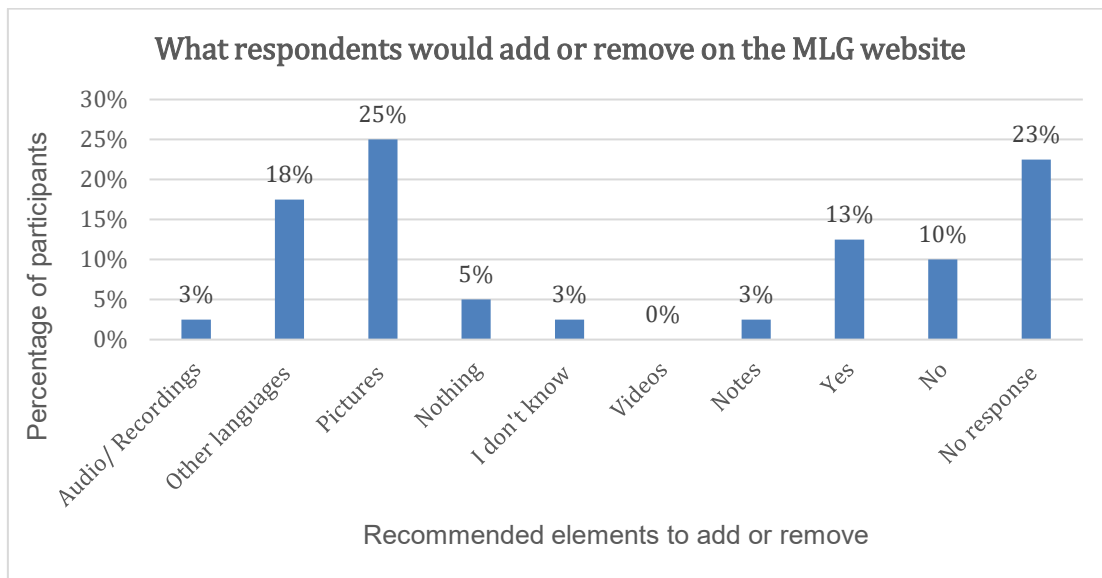


Figure 35: What respondents would add or remove on the MLG Website

The researcher draws on the relative focus group discussion to support the responses of the participants for this particular question. The highest response (25%) of the respondents indicated “pictures” as what could be added on the Horticultural 1 and Plant Material Studies multilingual glossary; other elements that could be added are as follows: other language (18%); audio or recordings (3%); and notes (3%). Five (5%) of the participants said “nothing” could be added or could be removed from the CPUT multilingual glossaries at that current time. Twenty-three (23%) of the participants did not respond to this question. Some of the respondents answered “Yes” (13%) and others answered “No” (10%), which the researcher found ambiguous not matching to the question.

4.5.2.7 We are given time to use the online multilingual glossaries website in our course programme.

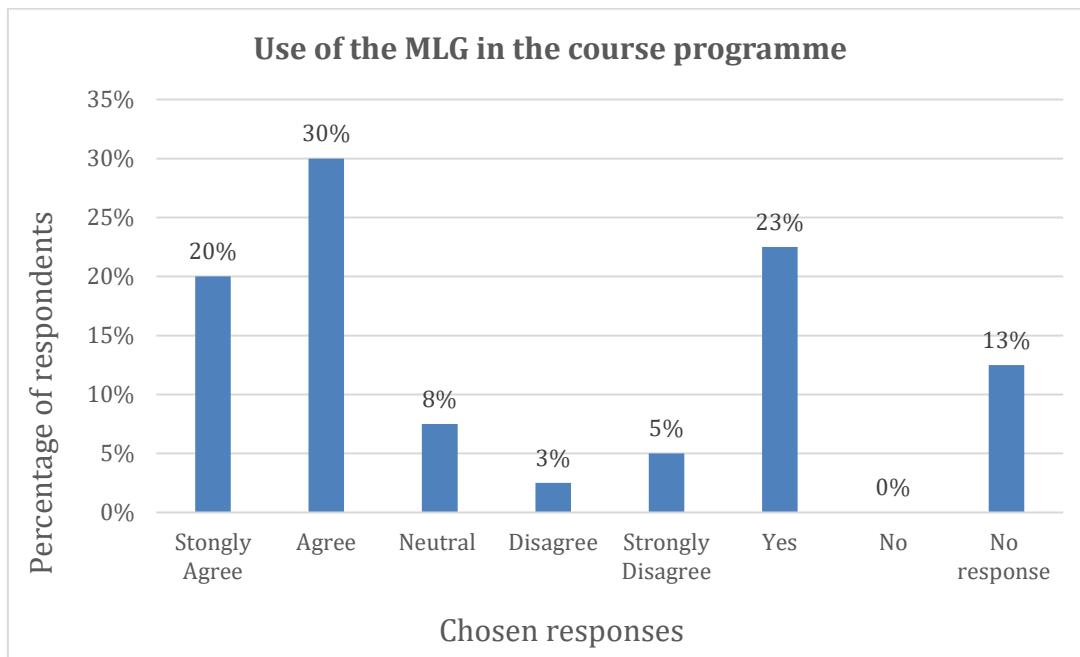


Figure 36: The use of MLG in the Horticulture 1 and Plant Material Studies course programme

Clearly, 50% of the respondents agreed or strongly agreed with the statement that they were given time in their course programme to use the online multilingual glossaries website; another 23% of respondents said “Yes” in agreement with the statement. Eight (8%) responded neutral. Of the respondents, 8% disagreed or strongly disagreed with the statement; also none (0%) of the participants said “No” when they were asked they were given time in their course programme to use the online multilingual glossaries website. Only 13% of the participants did not respond to this statement.

4.5.2.8 It was easy to find my subject on the online multilingual glossary website. Do you understanding the course content better when you see , hear, or read it?

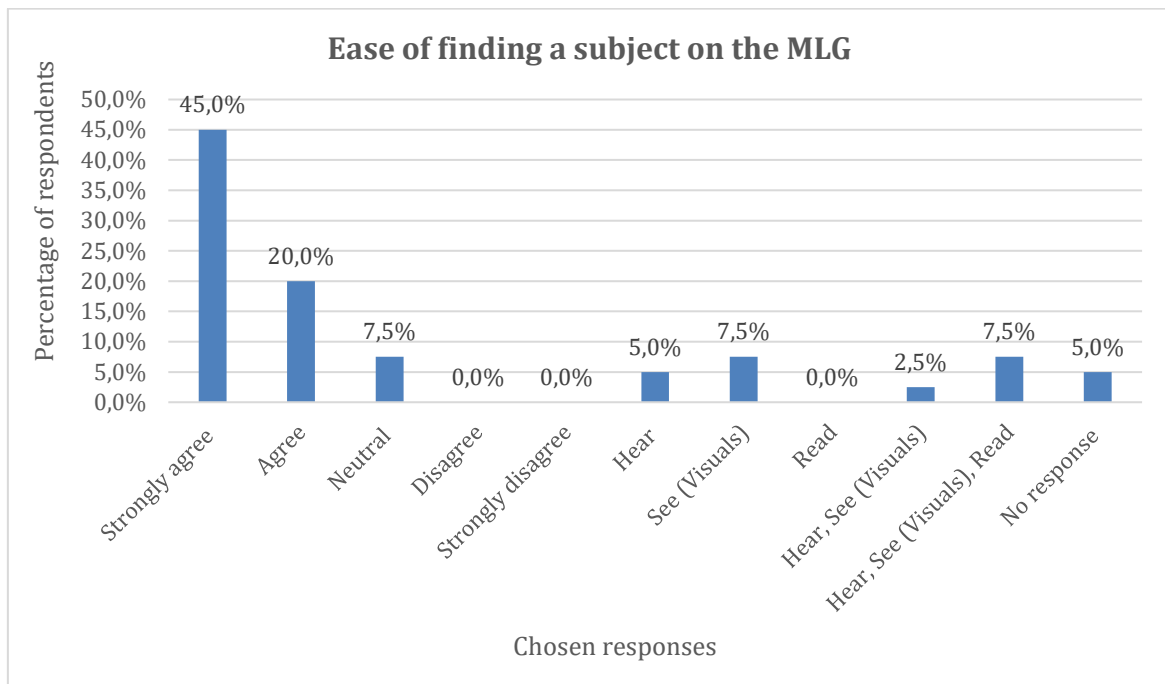


Figure 37: Ease of finding a subject on the MLG website

This question was created by combining two survey questions. The questionnaire was later amended, and the latter question was added as a brand-new question. This section also combines the participant responses. The highest number (65%) of the respondents agreed or strongly agreed with the statement that it was easy to find their subject on the online multilingual glossaries website; of the respondents, only 7,5% chose the neutral option; no (0%) respondents disagreed or strongly disagreed with this statement. A few respondents (8), answered the unrevised questionnaire from the Horticulture 1 and Plant Material Studies group where the question was : Do you understanding the course content better when you see, hear, or read it? The responses were as follows: 7.5% of the respondents preferred seeing (visuals); 2.5 % preferred hearing (audio) and seeing (visuals); and another 7.5% of the respondents indicated hearing (audio), seeing (visuals) and reading as preferred methods to understand their course content better.

4.5.2.9 The CPUT online multilingual website looks appealing to me.

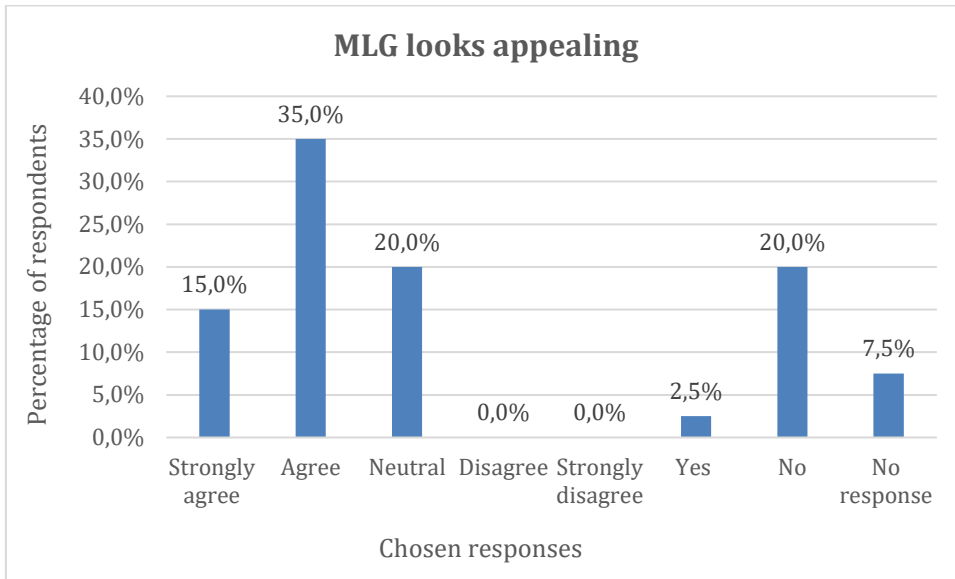


Figure 38: MLG website appeal

Before the Horticulture 1 and Plant Material Studies questionnaire was changed, this item was initially asked in a "yes" or "no" format. Data from both the original and the updated surveys are shown in this graph. Of the respondents, the majority (52.5%) agreed or strongly agreed and said “yes”, the CPUT online multilingual glossaries looks appealing to them, while 20% said “no” in disagreement with this statement. Another 20% of respondents chose the neutral option. Only 7.5% did not respond to this statement.

4.5.2.10 I was able to access the multilingual glossaries website when I was not on campus.

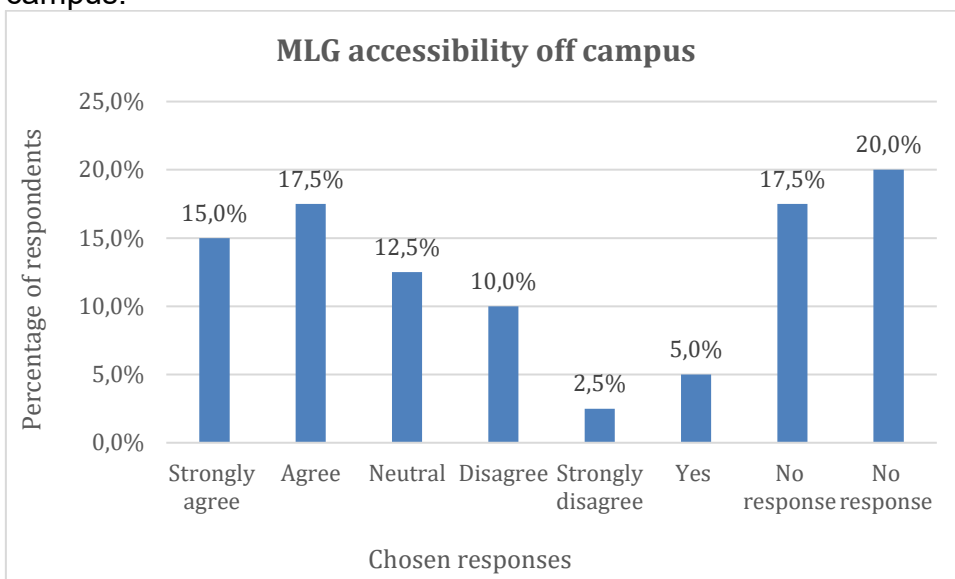


Figure 39: MLG website accessibility off campus

This graph also combines response from the initial and revised Horticulture 1 and Plant Material Studies questionnaires. Responses here were as follows: of the respondents 37.5 % agreed or strongly agreed and said “yes”, they were able to access the multilingual glossaries website, even when they were not on campus, while 12.5% of the respondents disagreed or strongly disagreed with this statement. Another 12.5 % responded neutral. A total of 37.5 % of the participants, combined from the initial and the revised questionnaires did not respond to this statement.

4.5.2.11 The level of the isiXhosa language used in the glossaries is understandable.

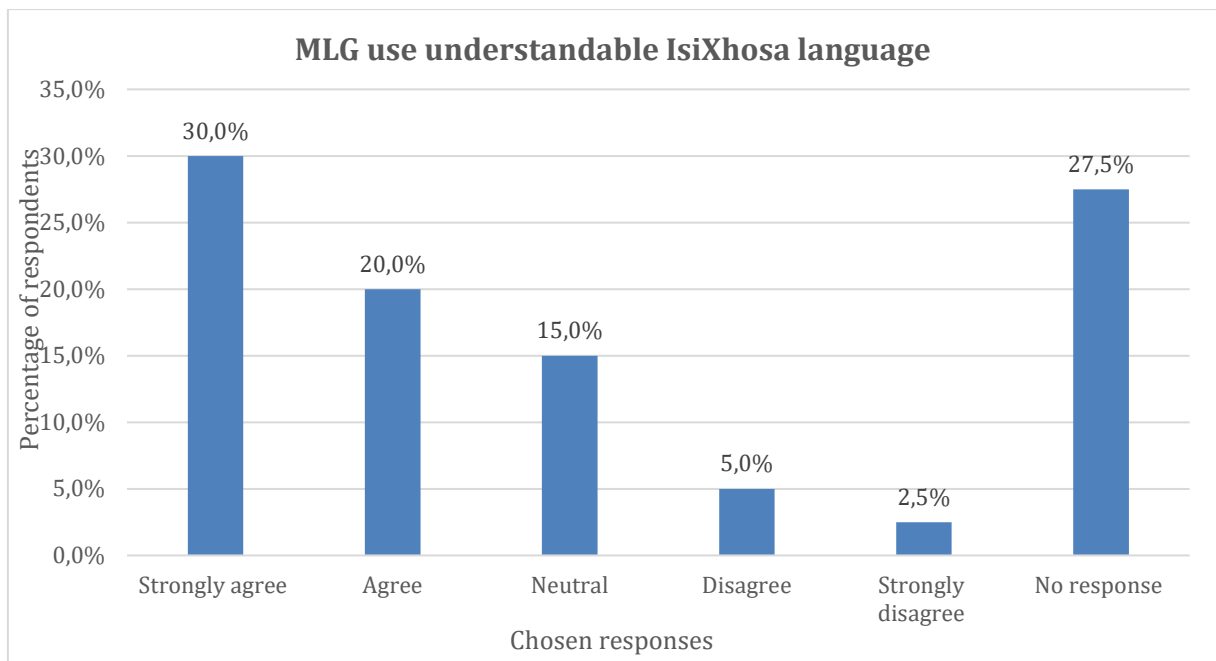


Figure 40: IsiXhosa language's level of understandability in the MLG

The highest percentage (50%) of the respondents agreed or strongly agreed that the degree or simplicity of the isiXhosa language used in the multilingual glossaries was understandable; 27.5% of the participants did not respond to this question; while 15% of the respondents chose the neutral option; lastly only 7.5% of respondents disagreed or strongly disagreed with this statement.

4.5.2.12 The level of the Afrikaans language used in the glossaries is understandable.

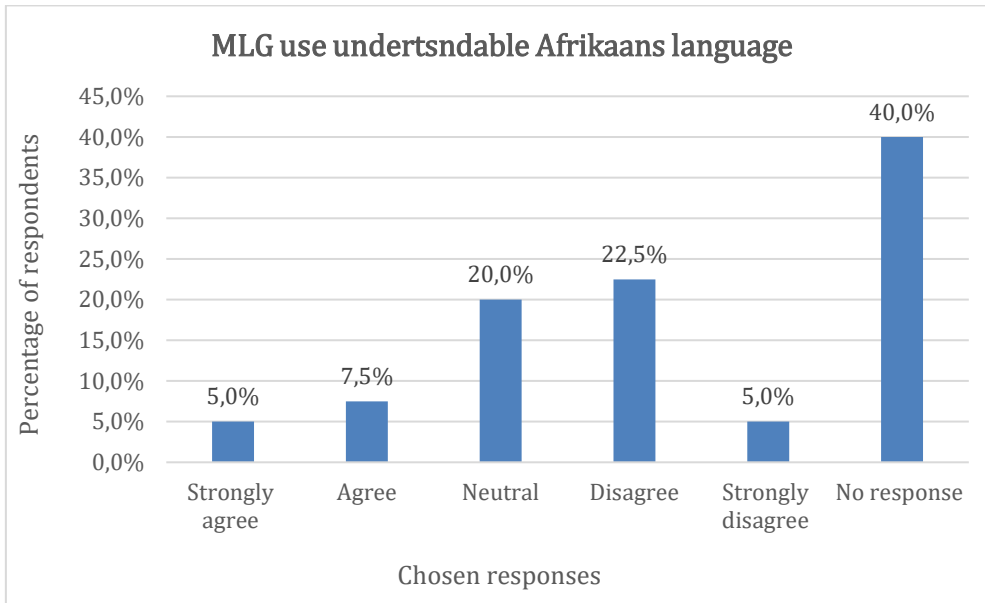


Figure 41: Afrikaans language's level of understandability in the MLG

A high percentage (40%) of the participants did not respond to the statement about the level of the Afrikaans language used in the multilingual glossaries being understandable, followed by 27.5% of the respondents who disagreed or strongly disagreed; 20% of the respondents chose neutral; while 12.5% of the respondents agreed or strongly agreed with this statement.

4.5.2.13 The level of the English language used in the glossaries is understandable.

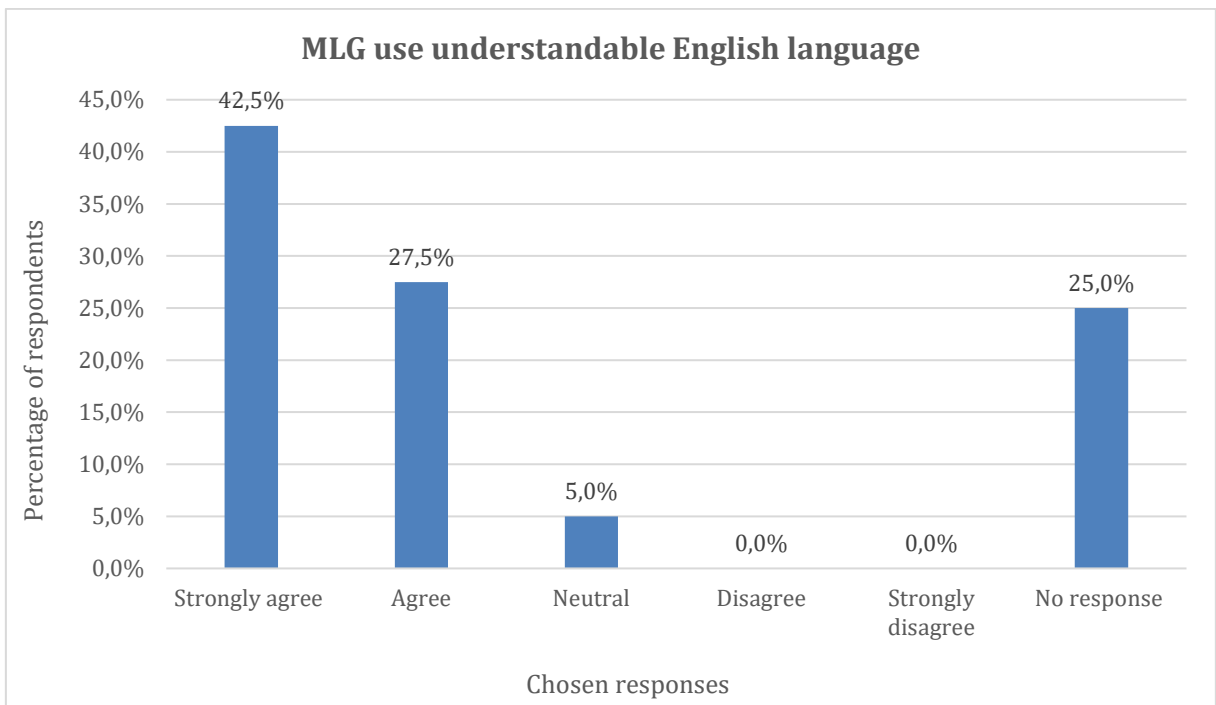


Figure 42: English language's level of understandability in the MLG

Clearly, from this strong response (70%), most respondents agreed or strongly agreed that the level of the English language used in the multilingual glossaries was understandable; of the participants, 25% did not respond to this statement; only 5% of the respondents chose the neutral option when they responded to this statement. No (0%) participants disagreed with this statement.

4.5.2.14 I would recommend the use of African languages in higher education.

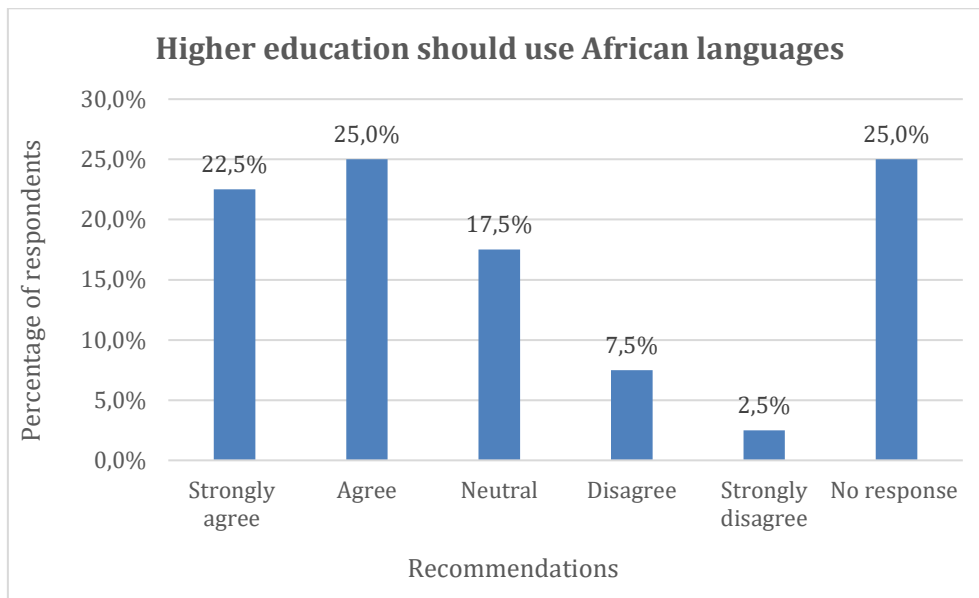


Figure 43: The use of African languages in higher education

This statement was agreed or strongly agreed with by 47.5% of the respondents (they would recommend the use of African languages in higher education). Another 25% of the participants did not respond to this statement, while 17.5% of the respondents chose the neutral option; only 10% of the respondents disagreed or strongly disagreed with the statement of recommending the use of African languages in higher education.

4.5.2.15 I have to translate the English language, to understand better when I study or during lectures.

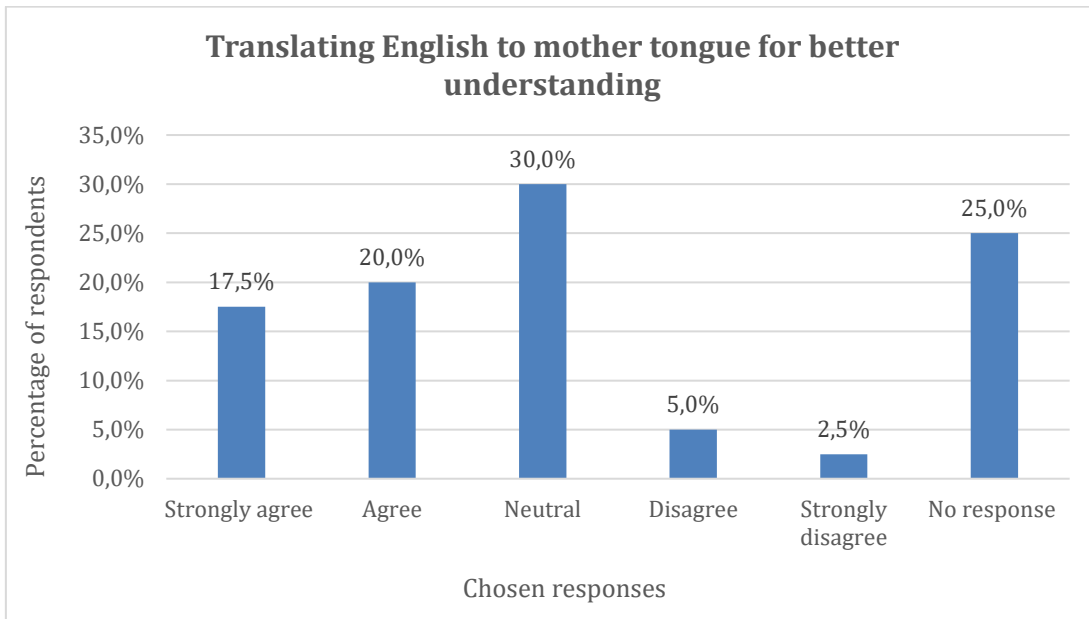


Figure 44: Translation of English to mother tongue for better understanding

Most (37.5%) of the respondents agreed or strongly agreed when it came to the question of translating English into their mother tongue for better understanding; a total of 30% of the respondents chose the neutral option; while 25% of the participants did not respond to this statement, only a few (7.5%) respondents disagreed or strongly disagreed with this statement.

4.5.2.16 I understand course material better when I hear it.

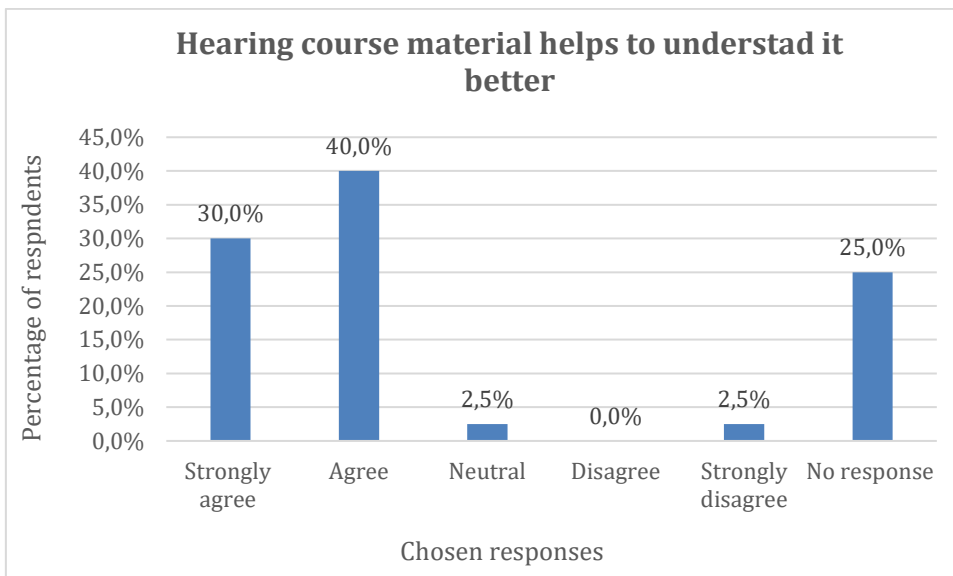


Figure 45: Hearing course materials helps with better understanding

Clearly, the majority (70%) of respondents agreed or strongly agreed that they understood course materials better when they hear it, referring to audio material and not only on the multilingual glossaries but in general as a method to study; while 2.5% of the respondents strongly disagreed with this statement. Another 2.5% of the respondents chose the neutral option in response to this statement. Lastly 25% of the participants did not respond to this statement.

4.5.2.17 I understand course material better when I see it.

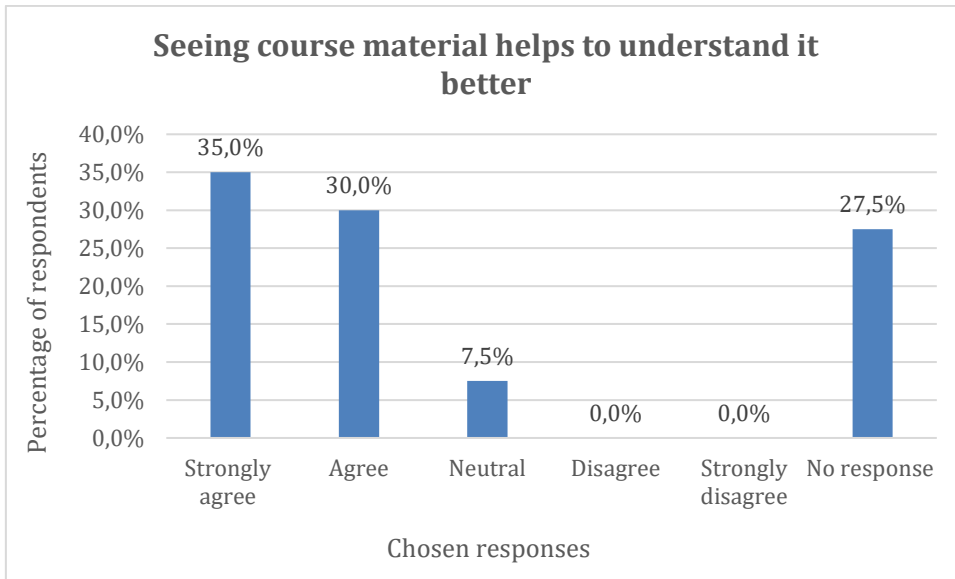


Figure 46: Seeing course materials helps with better understanding

Of the respondents, 65% agreed or strongly agreed that they understand course material better when they see it, referring to visual material like video clips; while none (0%) of the respondents disagreed nor strongly disagreed with this statement respectively. A number (27.5%) of participants did not respond to this statement; only a few (7.5%) of the respondents chose the neutral option.

4.5.2.18 I understand course material better when I read it.

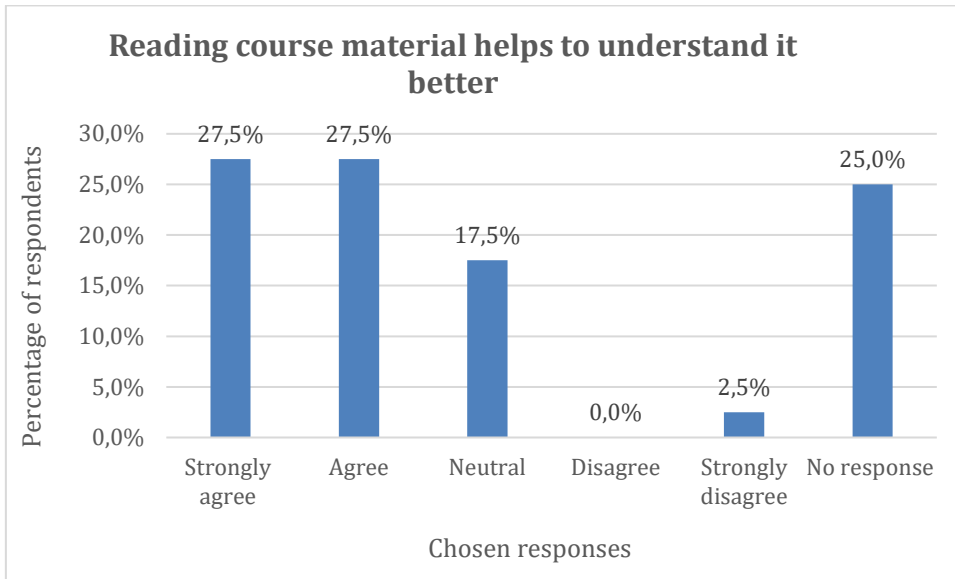


Figure 47: Reading course materials helps with better understanding

Of the respondents, more than half (55%) of the whole group agreed or strongly agreed that they understand course material better when they read it; while (2.5%) of the respondents strongly disagreed with this statement; 25% of the participants did not respond to this statement; and 17.5% went with the neutral choice.

4.5.2.19 I would prefer additional learning resources in my home language.

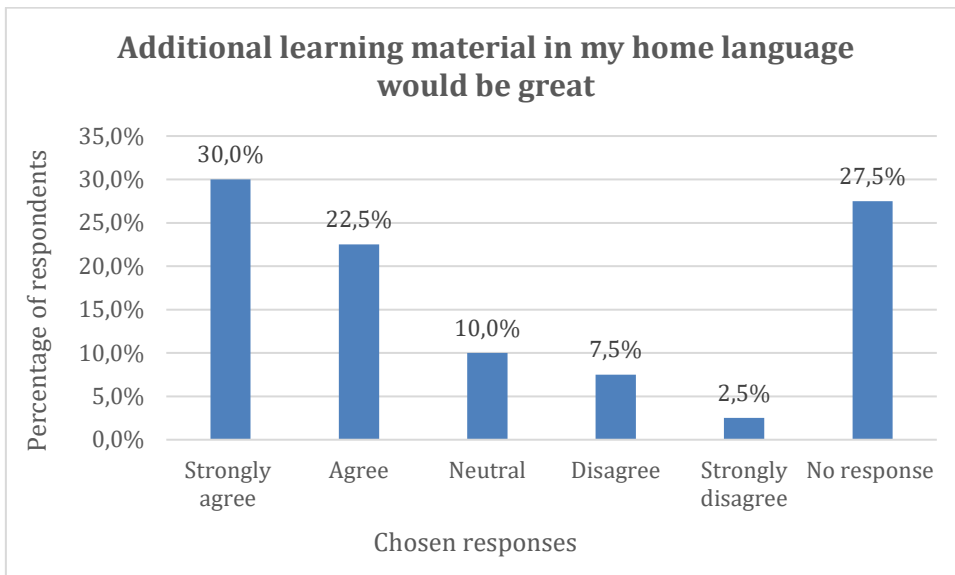


Figure 48: Preference for learning materials in a home language

More than half (52.5%) of the respondents agreed or strongly agreed that they would prefer additional learning resources in their home language; followed by 27.5%

representing participants who did not respond to this statement; while 10% of the respondents selected the neutral option; another 10% of respondents only disagreed or strongly disagreed with this statement.

4.5.2.20 I am concerned about understanding my course content.

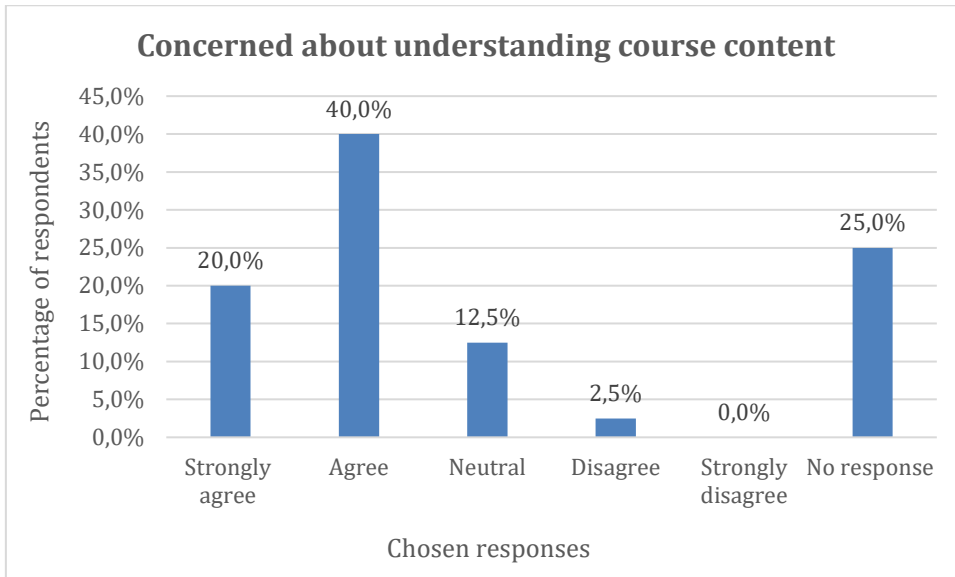


Figure 49: Concern about understanding course content

Clearly, the majority (60%) of the respondents agreed or strongly agreed that they were concerned about understanding their course content; a total of 25% of the participants chose not to respond to this statement; only 12.5% of the respondents opted for the neutral choice; lastly, very few (2.5%) respondents with this statement.

4.5.2.21 Which examples of additional learning resources would you need in your home language?

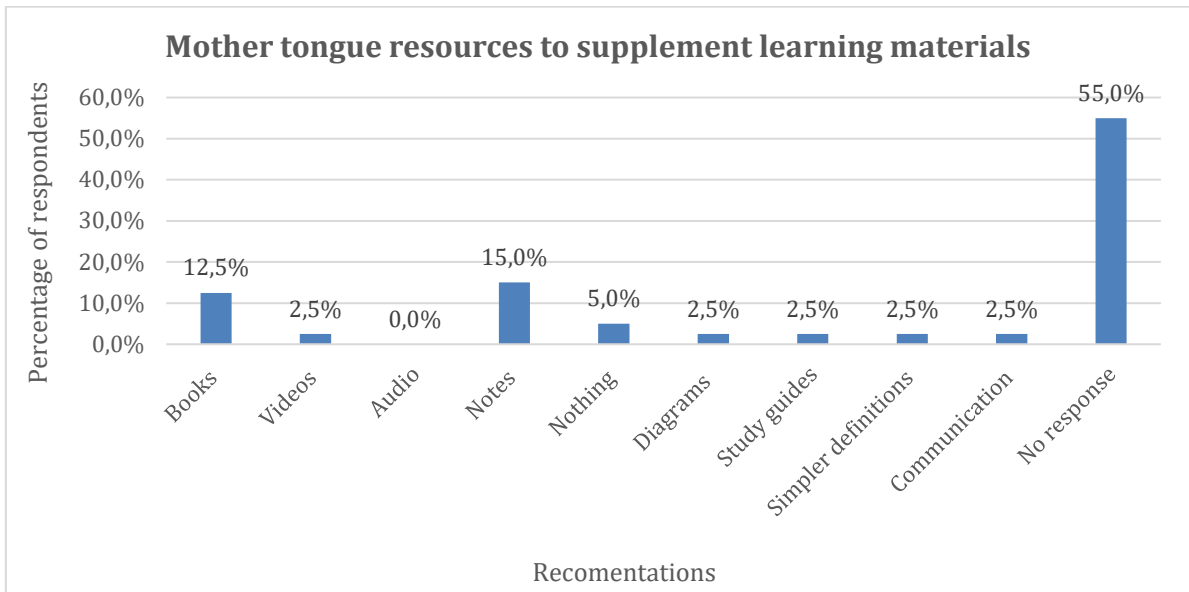


Figure 50: Examples of leaning materials needed in a home language

Most (55%) of the participants did not answer this question about which examples of additional learning resources they would need in their home language. Other respondents gave the following examples: books (12.5%); videos (2.5%); notes (15%); diagrams (2.5%); study guides (2.5%); simpler definitions (2.5%); and communication (2.5%), the researcher cannot verify what kind of communication the respondents referred to.

4.5.2.22 What are your concerns, if any, about understanding your course content?

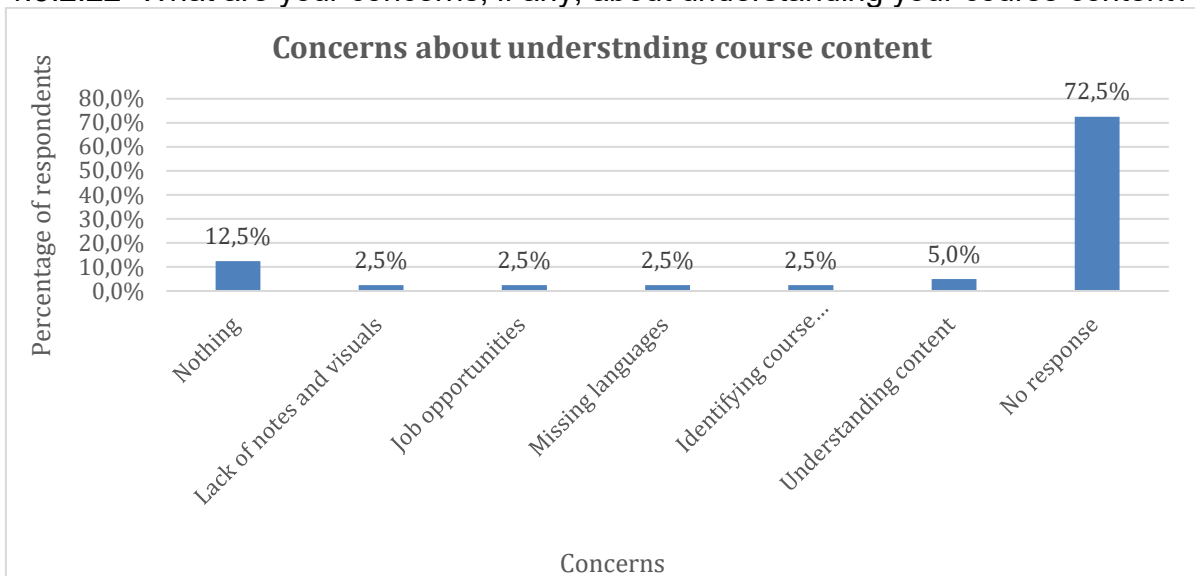


Figure 51: Concern about understanding course content

A large majority (72.5%) of the participants did not answer this question about what their concerns were, if any, about understanding their course content. Those who responded chose these concerns: nothing (12.5%); lack of notes and visuals (2.5%); job opportunities (2.5%); missing languages (2.5%); identifying course materials (2.5%); and understanding content (2.5%).

4.5.2.23 How often do you use the website?

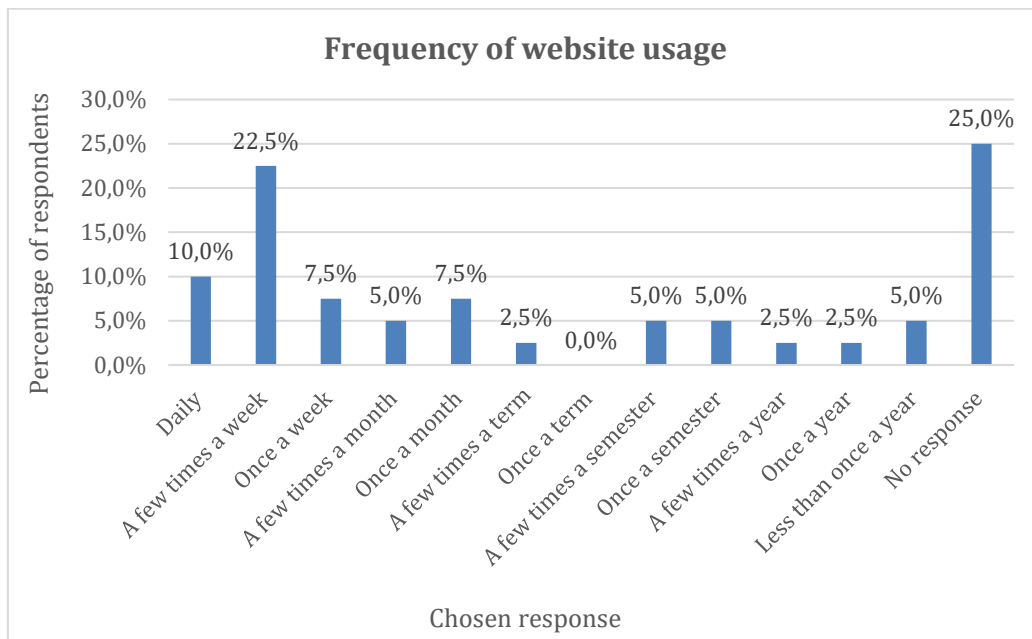


Figure 52: Frequency of using the MLG website

One-quarter (25%) of the participants did not answer this question about how often they used the multilingual glossaries website, while other participants responded as follows: daily (10%); a few times a week (22.5%); once a week (7.5%); a few times a month (5%); once a month (7.5%); a few times a term (2.5%); once a term (0%); a few times a semester (5%); once a semester (5%); a few times a year (2.5%); once a year (2.5%); and less than once a year (5%).

4.5.3 Law of Contracts

4.5.3.1 How did you get to know about CPUT online multilingual glossaries?

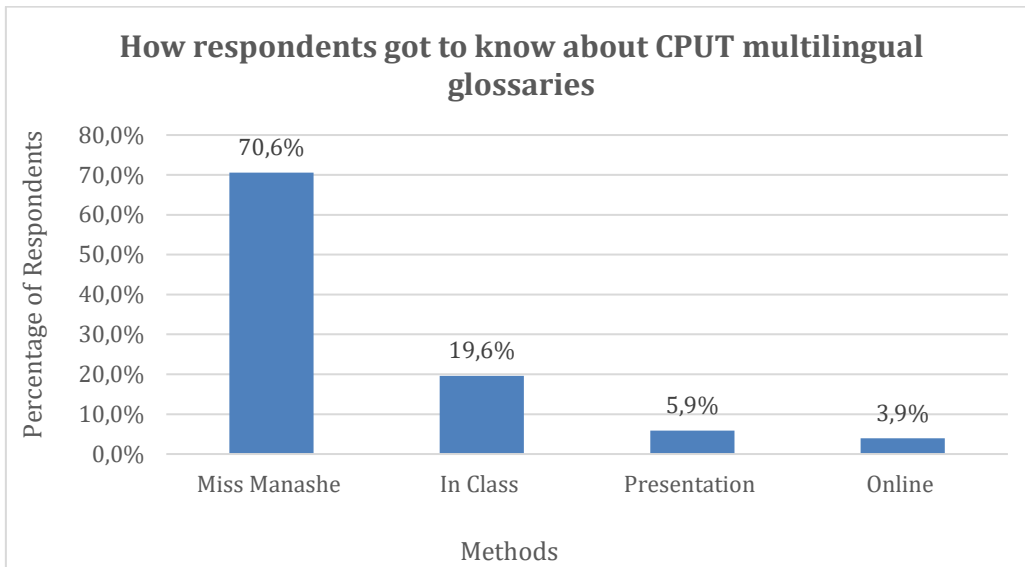


Figure 53: How respondents learned about the multilingual glossaries (MLG) at CPUT

When asked how they learned about the CPUT online multilingual glossaries, the majority of respondents (70.6%) said they heard about it from Miss Manashe. Following closely behind were 19.6% of respondents who learned about the multilingual glossaries in class; other respondents (5.9%); those who learned about them online (3.9%).

4.5.3.2 Do you think the multilingual glossaries website is easily accessible?

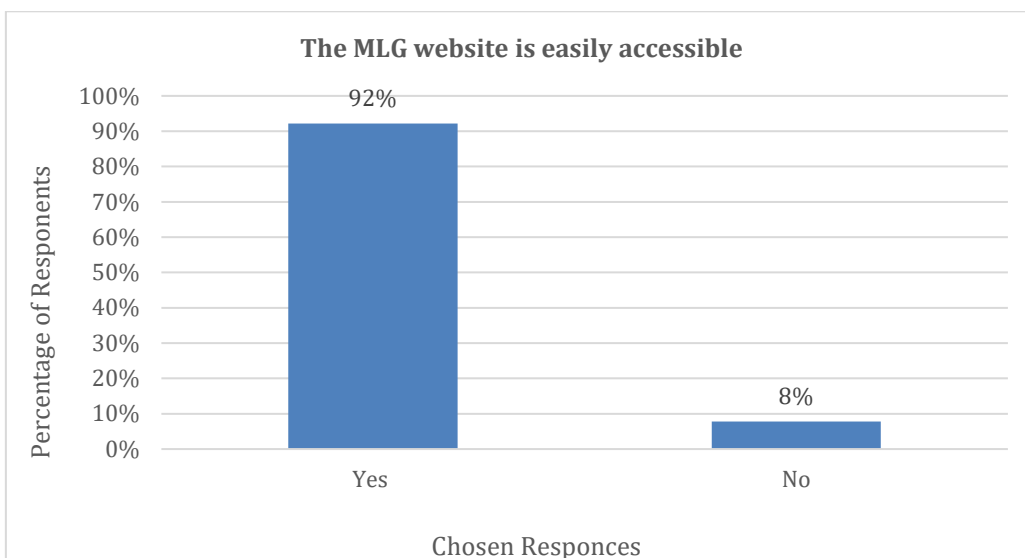


Figure 54: MLG website accessibility

By far the majority (92%) of the respondents selected ‘Yes’, they thought the multilingual glossaries website was easily accessible. Only 8% of the respondents disagreed with this statement.

4.5.3.3 What was most useful to you on the multilingual glossaries website?

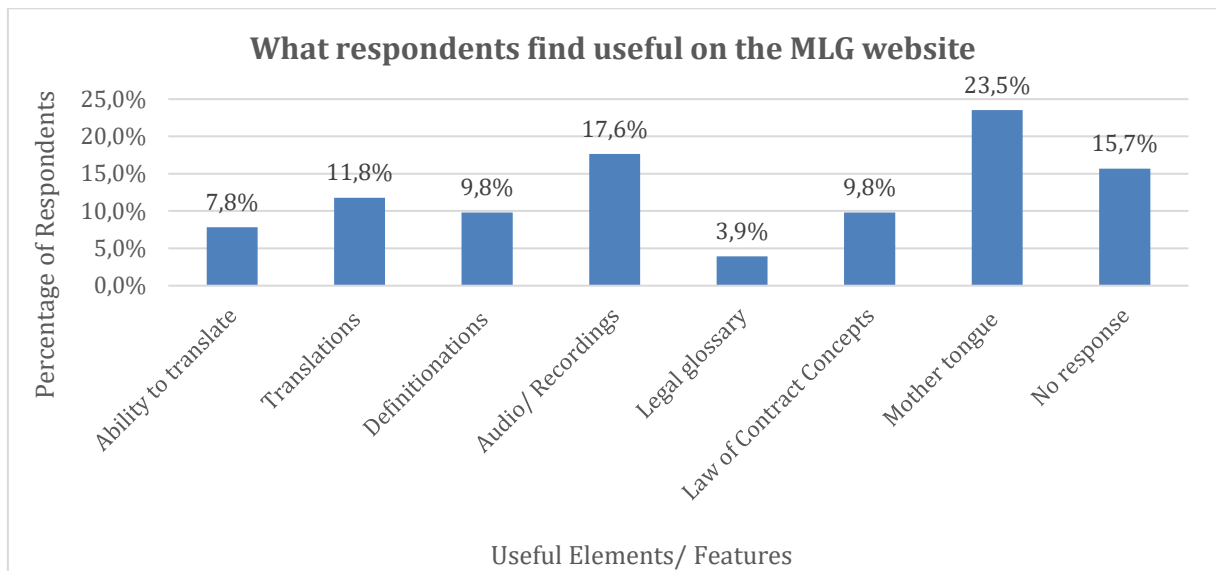


Figure 55: What respondents found most useful about the MLG website

When asked what was most useful to them on the multilingual glossaries website, the majority of respondents (23.5%) said their mother tongue; this was followed by 17.6% of respondents who said audio/recordings; translations were mentioned by 11.8% of the respondents; definitions and Law of Contract concepts was chosen by 9.8% of respondents; the ability to translate was most helpful to 7.8% of respondents; a few (3.9%) participants said the legal glossary was most useful, and those who did not respond to this question made up 15.7% of the respondents .

4.5.3.4 What did you like most/ least about the online multilingual glossaries website?

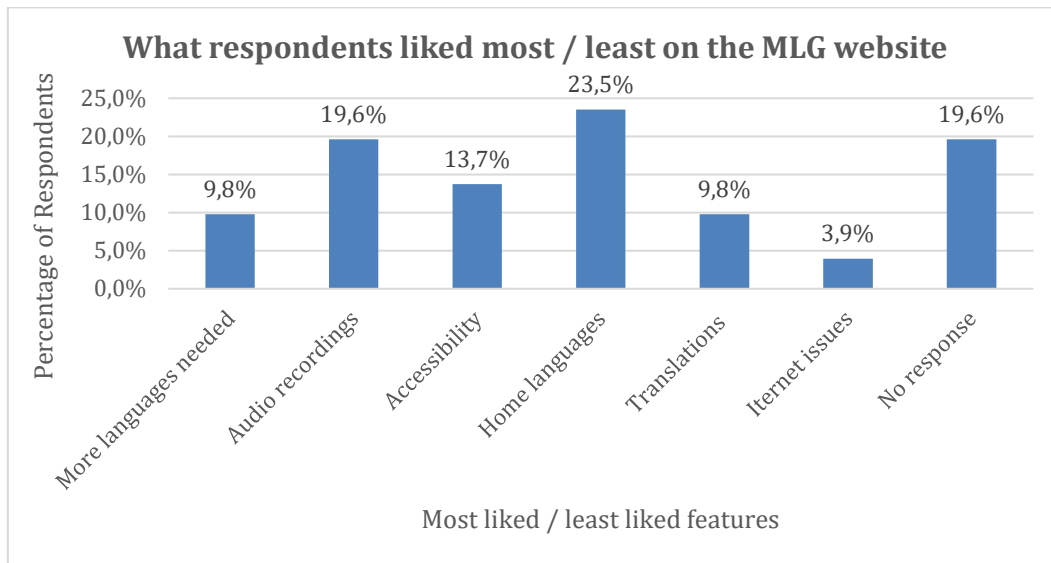


Figure 56: What respondents liked most or least about the MLG website

The researcher tied in the responses from a discussion group to support the responses to this question. When the respondents were asked what they liked most or least about the online multilingual glossaries website, they responded as follows: the home languages was loved by most participants (23.5%); followed by audio recordings which was appreciated by 19.6% of the participants; there was mention of convenience and ease of access which lead to 13.7% of the participants to liking the accessibility of the MLG website; translations was also among the most liked by 9.8% of the participants; another 9.8% of participants said that the MLG website should offer more languages because there are only three available currently; only 3.9% of the participants reported internet issues they did not enjoy, and the majority of these problems were connectivity when participants were off campus. A total of 19.6% of the participants did not respond to this question.

4.5.3.5 Do you feel that the level of language (isiXhosa, Afrikaans or English) used in the glossaries is understandable? Please elaborate.

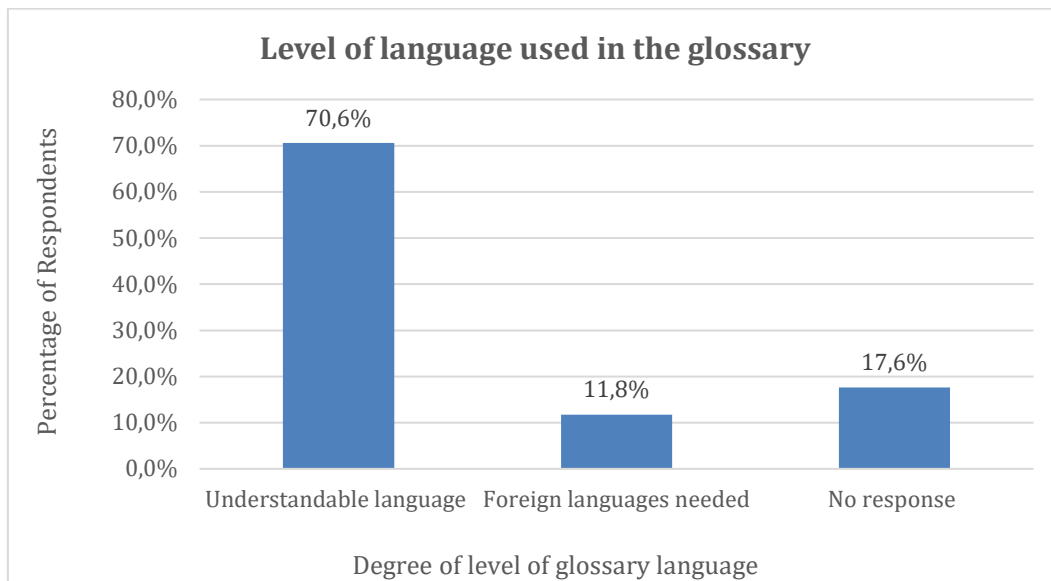


Figure 57: The level of the languages used in the MLG

Most of the respondents (70.6%) agreed that the level of the languages of the multilingual glossaries, being isiXhosa, Afrikaans, and English, was understandable to them. Other respondents (11.8%) went on to indicate that they needed foreign languages represented in the multilingual glossaries, while 17.6% of the participants did not answer this question.

4.5.3.6 Would you recommend the use of African languages in higher education?

Yes/ No

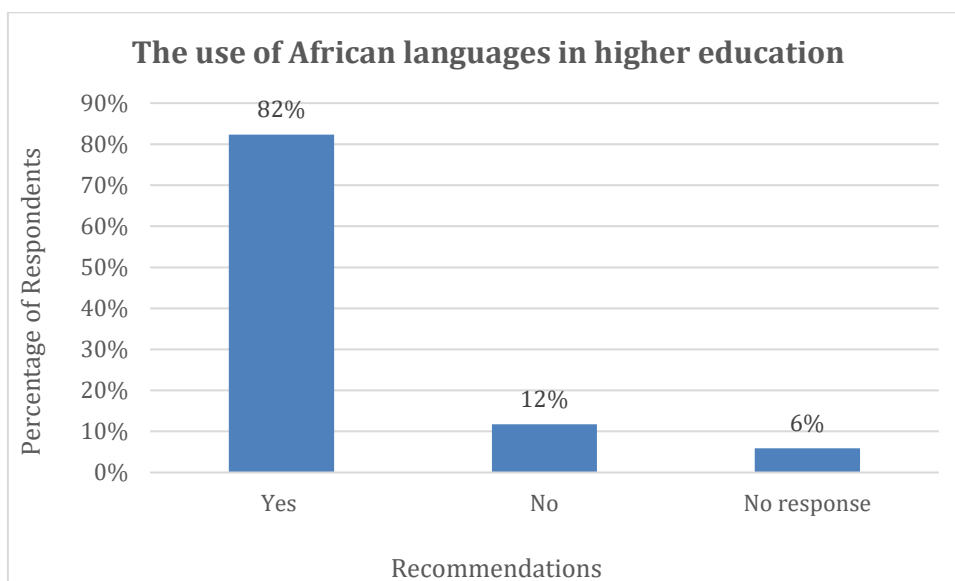


Figure 58: The use of African languages in higher education

By far the majority (82%) of respondents selected 'Yes', they would recommend the use of African languages in higher education; 12% of the respondents selected 'No' in disagreement with this statement; and 6% of the participants did not provide an answer to this question.

4.5.3.7 Do you have to translate English content into a language you better understand when you study or during lectures? Yes/No

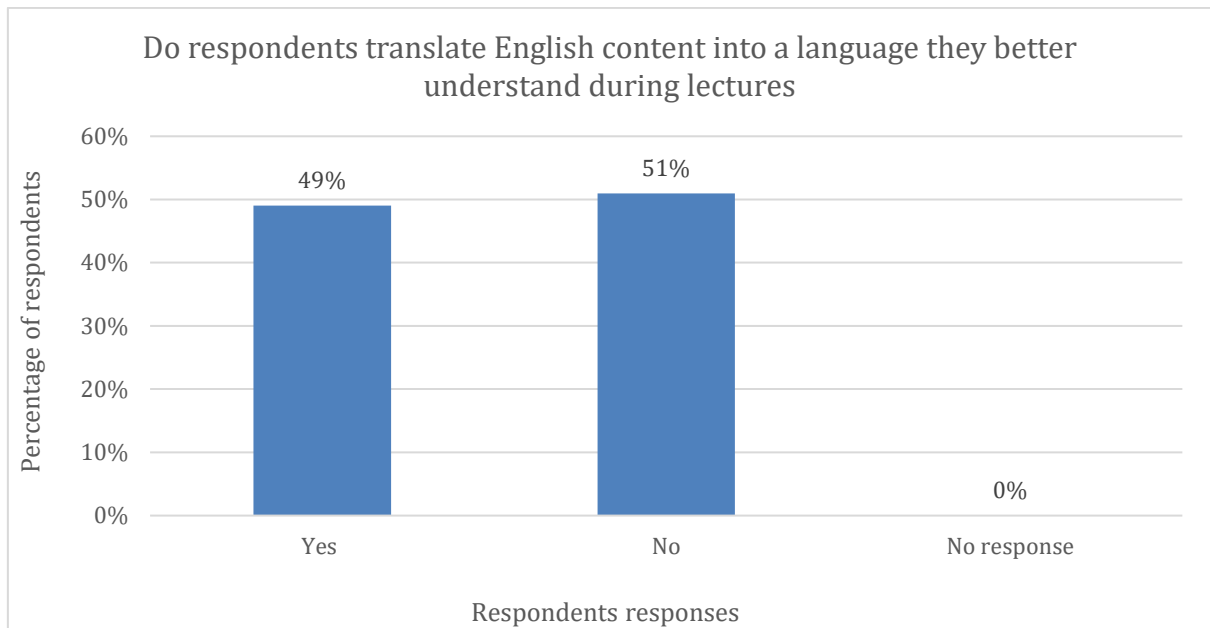


Figure 59: Translation of English to another language for better understanding

The responses were fairly balanced: 49% of the respondents selected 'Yes', they did translate English content into a language they understood better when they studied or during lectures, while 51% of the participants selected 'No', disagreeing with this statement.

4.5.3.8 Do you understand course material better when you hear, see, or read it?

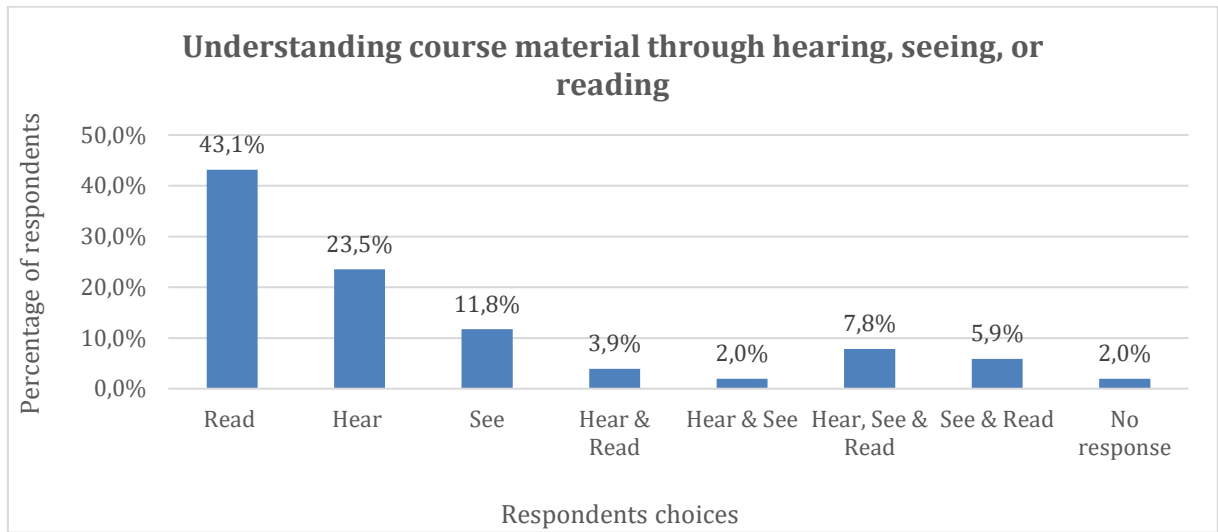


Figure 60: Understanding course material through hearing, seeing or reading

Responding to the question of whether the participants understood course materials better when they heard, saw or read it, the responses were as follows: The majority of participants, 43.1%, said they understood the course material better when they read it; this was followed by 23.5% who preferred hearing, or audio material; and 11.8% who preferred seeing, or visual material. Additionally, a variety of ways were mentioned by the respondents as aiding in a better understanding of the course materials: hear and read (3.9%); hear and see (2.0%); hear, see, and read (7.8%); and see and read (5.9%). Only 2% of the participants chose not to respond to this question.

4.5.3.9a Would you prefer additional learning resources in your home language? Yes/ No

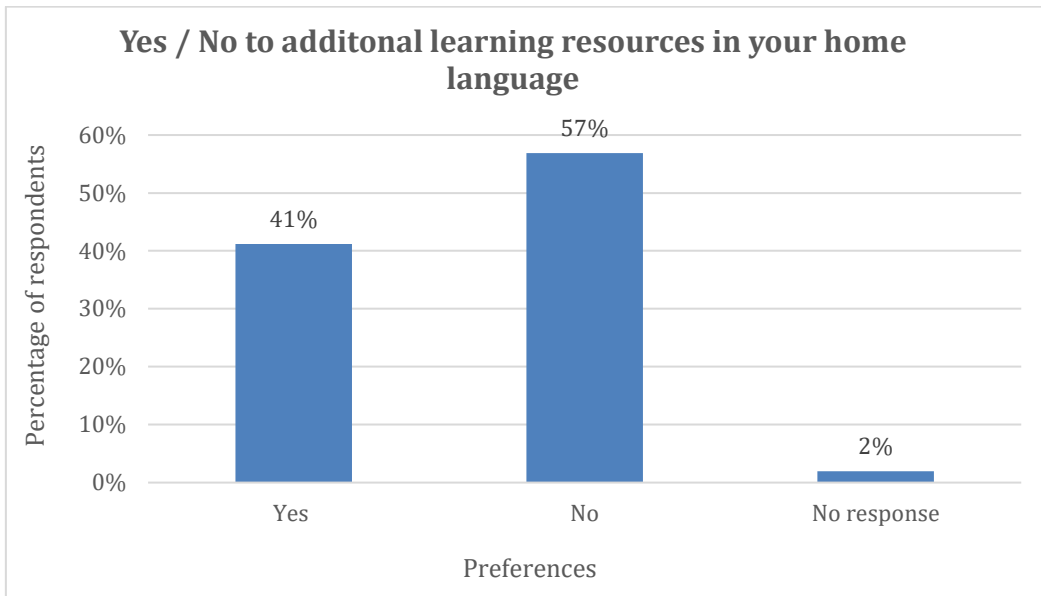


Figure 61: Preference for learning materials in a home language

Of the respondents, 57% selected 'No', they would not prefer additional learning resources in their home language, while 41% selected 'Yes' in response to this statement. A few (2%) of the participants did not respond to this question.

4.5.3.9b Would you prefer additional learning resources in your home language? If 'Yes', give examples.

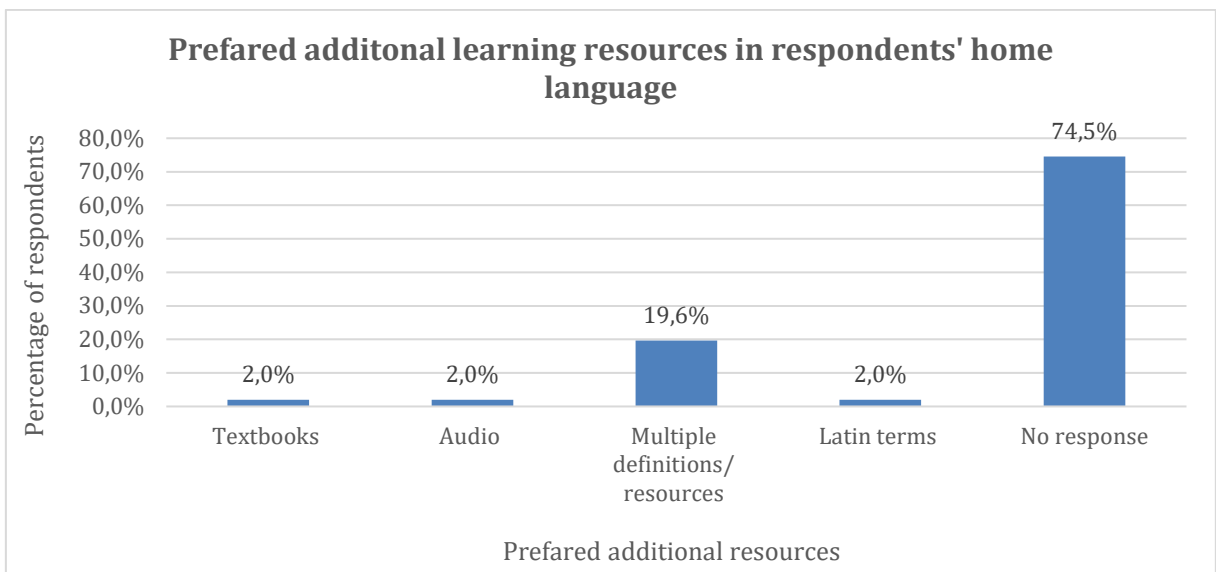


Figure 62: Types of resources preferred in home language as learning materials

Extending on the previous question in 4.5.3.9a, the respondents indicated the following examples of materials they would prefer in their home languages: 2% would prefer textbooks; audio; and Latin terms (this refers to Latin terms translated into the respondents' home languages); 19.6% of the respondents would prefer multiple definitions or resources in their home languages; and 74.5% of the participants did not respond to this question.

4.5.3.10a Are you concerned about understanding your course content? Yes/ No

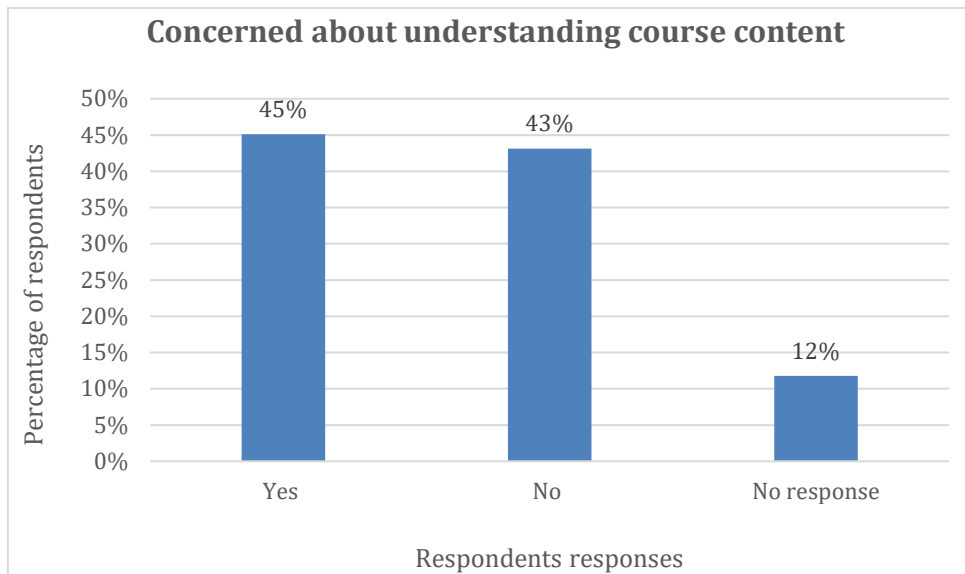


Figure 63: Concern about understanding course content

The responses were almost equal here: 45% of the respondents selected 'Yes', i.e., they were concerned about understanding their course content, while 43% selected 'No', they were not concerned; and 12% of the participants did not respond to this question.

4.5.3.10b Are you concerned about understanding your course content? If 'Yes', what are your concerns?

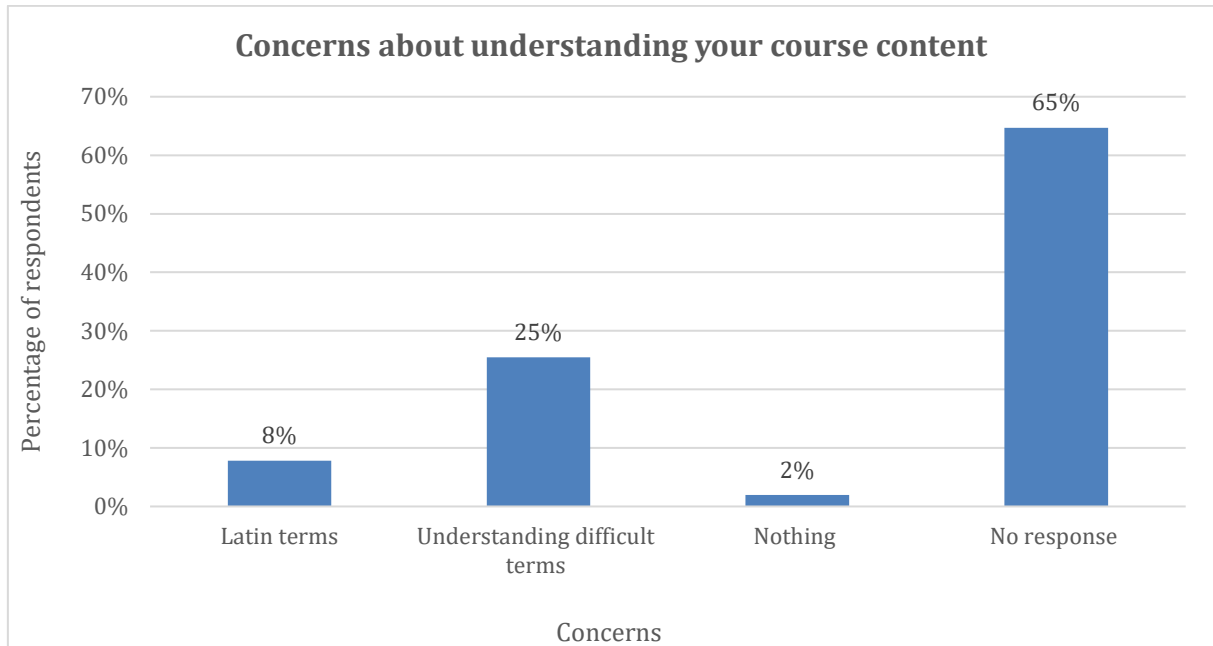


Figure 64: What concerns respondents about their course content

When participants were asked what they were concerned about in understanding their course content, 65% did not respond to the question. The other responses were as follows: 25% were concerned about understanding difficult concepts; 8% of the respondents were concerned about understanding Latin terms in their course content; and only 2% of respondents typed the word "Nothing", which was vague and prevented the researcher from being able to defend or explain this response.

4.5.3.11 What can be added or be removed from the current CPUT multilingual glossaries website?

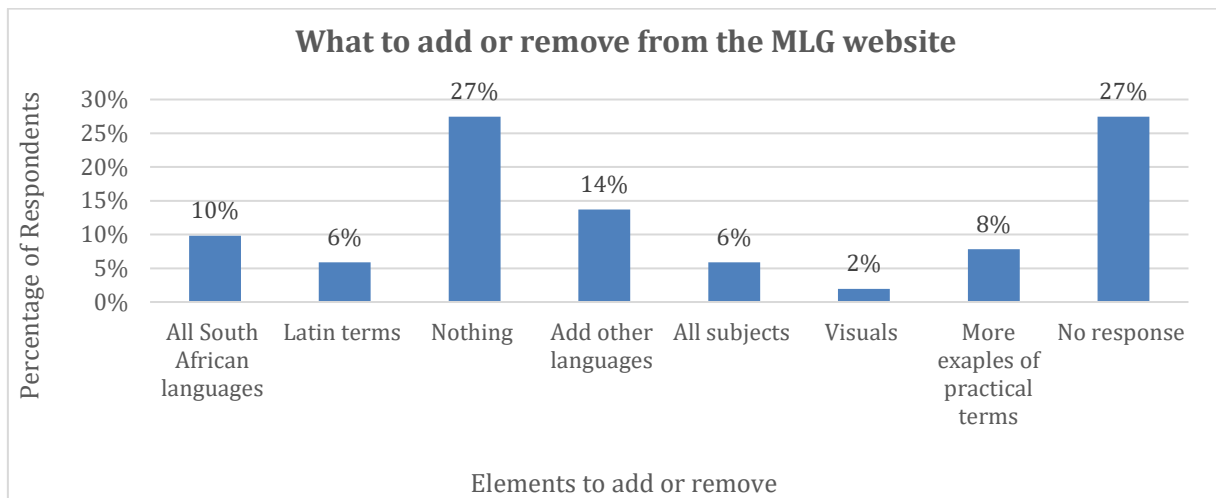


Figure 65: What can be added or removed on the MLG website

The focus group discussion backs up the answers to this question. To support the responses below, the researcher uses information from the focus group discussion. When the participants were asked what could be added or removed from the multilingual glossaries website, they responded as follows: A total of 27% of participants indicated "Nothing" needed to be changed on the multilingual glossaries website, while a further 27% chose not to answer. Other participants mentioned the following: A total of 14% of respondents said that the multilingual glossaries should "include other languages," further demonstrating the necessity to include speakers of other African languages so that they can also learn concepts in their mother tongues; "all South African languages" were requested to be added by 10% of the participants citing concern that the other African language speaker were being left out from benefiting from the multilingual glossaries; "more examples of practical terms" was indicated as another addition by 8% of the participants; "Latin terms" were highlighted as a need by 6% of the participants, as they mentioned that they struggle with learning Latin concepts and that the Latin language is difficult to understand; another 6% of participants requested "all other subjects" to be added on the multilingual glossaries; and only 2% of the participants wanted "visuals".

4.6 Data analysis: quantitative study

The participants wrote two multiple-choice exercises for the researcher to gain insight into their level of understanding of the academic concepts in their relative courses. One exercise was done as a pre-test at the beginning of the research project, when

participants had not yet used the multilingual glossaries. The second multiple-choice exercise was done as a post-test after the participants had been given a chance to use the multilingual glossaries. All participants were given an academic term as a time frame before the post-test.

4.6.1 Quasi-experiment scores:

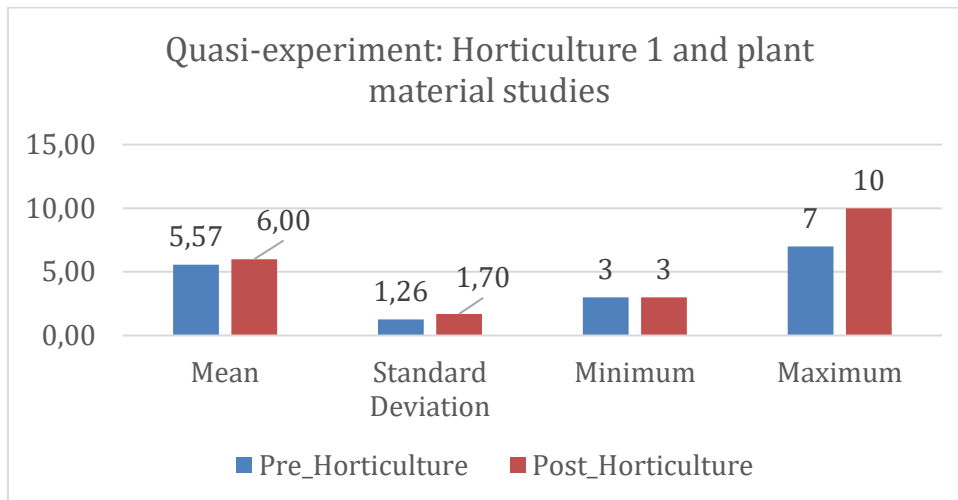


Figure 66: Quasi-experiment for Horticulture 1 and Plant Material Studies

In the Horticulture 1 and Plant Material Studies, for the pre-test multiple choice exercise, the participants had a mean score of 5.57 and a standard deviation of 1.26; in the post-test multiple choice exercise, they had a mean score of 6.00 and a standard deviation of 1.70. (An average is the same as a mean.) The mean is affected by outlier scores, or scores that are extremely high or extremely low. Because the post-test had a higher mean, this indicates that, after participants were exposed to the multilingual glossaries website, they scored better on average than before they engaged with their academic concepts in different languages provided in the multilingual glossaries.

The standard deviation is a measure of variation based on measuring how far each data value deviates, or is different, from the mean. Characteristics of the standard deviation include:

- The standard deviation is always positive. The standard deviation will be zero if all the data values are equal, but will become larger as the data are more widely distributed.
- The standard deviation has the same units as the original data.

- The standard deviation, like the mean, can be highly influenced by outliers.

Because the pre-test had a smaller standard deviation, this means the data, or the scores, were less spread out from the mean; however, the post-test recorded a larger standard deviation, with the data more spread out from the mean. The pre-test therefore had more consistent scores because the standard deviation was smaller than in the post-test and much closer to the mean of the pre-test scores.

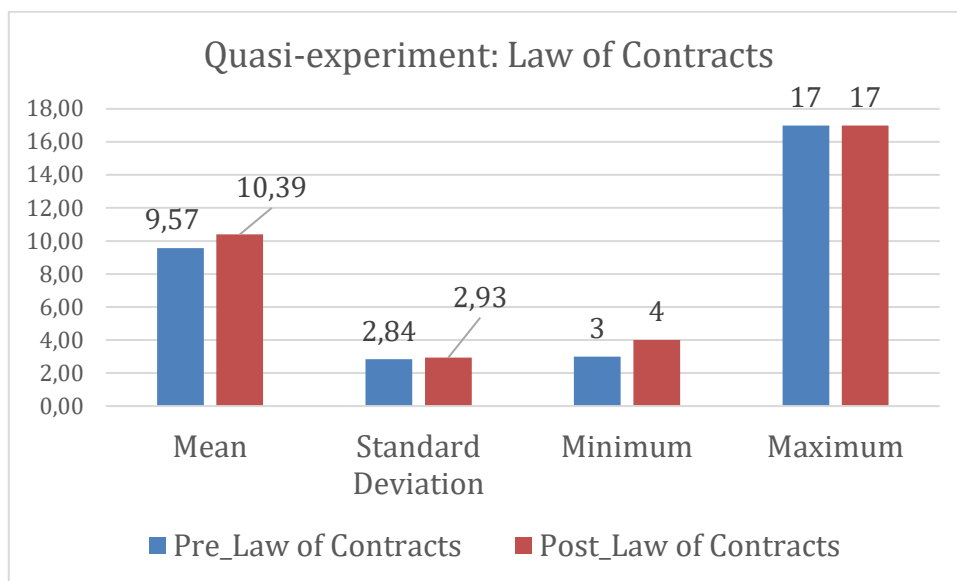


Figure 67: Quasi-experiment for Law of Contracts

Depicted here in Figure 67 is the Law of Contracts quasi-experiment, with a mean score of 9.57 for the pre-test multiple choice exercise and a standard deviation of 2.84. The post-test multiple choice exercise had a mean score of 10.39 and a standard deviation of 2.93. Compared to the mean for the pre-test, the post-test had a higher mean, meaning that the participants scored better on average after they had used the multilingual glossaries. Furthermore, looking at the information in Figure 66, the standard deviation of the pre-test is smaller than that of the post-test. This means that the pre-test in this case also had consistent multiple choice test scores.

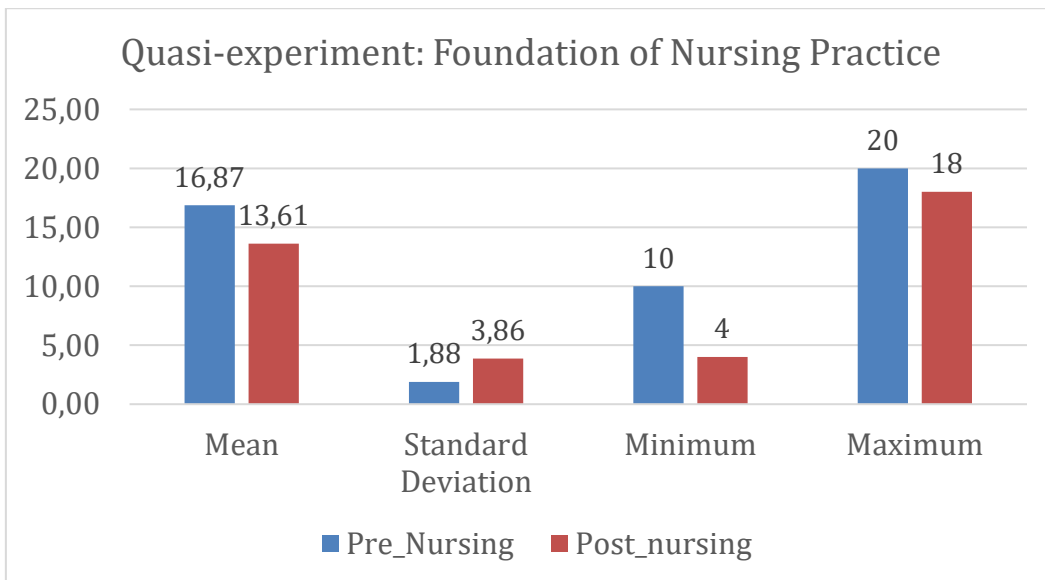


Figure 68: Quasi-experiment for Foundation of Nursing Practice

Figure 68 shows the scores from the Foundation of Nursing Practice as follows:

The mean score for the pre-test multiple choice exercise was 16.86, with a standard deviation of 0.88. The post-test multiple choice exercise had a mean score of 13.61, and a standard deviation of 2.93.

In this case, a significant record for the post-test shows a smaller mean score. This means that the participants scored more poorly on average after they had used the multilingual glossaries, compared to their mean for the pre-test, which was higher. The standard deviation of the pre-test was smaller than that of the post-test. This means the pre-test had consistent multiple choice test scores.

4.6.2 Google Analytics report

The researcher already understands the concept of the visitor intent (what a website user intends to do in a website) (Kumar, Singh, & Kaur, 2012). In this case, this is the understanding that most users visit the CPUT multilingual glossaries website with a purpose, namely to learn the academic concepts in their specific study fields and, furthermore, to access this content in Afrikaans and isiXhosa, both of which are readily provided on our multilingual glossaries website.

The success of this website therefore also depends on whether the intent of the user is being served (the intent being to do on the website what they came to do, resulting in user satisfaction about their interaction with the website). One of the factors that can

indicate that the users found the website useful is user engagement statistics as these can provide insight into the extent of the repeat users who keep coming back to the content, as well as new users who are attracted to the website.

To bring further insight into answering research questions 1, 1.1 and 2, the researcher looked into the following matrices to measure user engagement and the success of the online multilingual glossaries website: **user demographics, user behaviour, and technology use**. Table 6 summarises the key constructs in each matrix, along with their operational details, as enabled by Google Analytics (i.e., definitions, data visualisation and matrix values).

Table 6: Google Analytics key matrices examined and their functions

Matrix	Key performance Indicators (KPIs)	Description	Matrix value	Visual
User Demographics	Geolocation	User location based on IP address	City, country, or continent	Map
	Language	Primary Language from browser setting	Language codes (e.g., en-za English South Africa)	Pie chart
User Behaviour	Traffic	How did the users find the the MLG website and where were they before?	Access through referral sites: Direct (type URL) Organic (unpaid search, and referral (hyperlink)	Pie chart
	Effort	Time and effort spent on the MLG website	Page views, unique views, average time on	Line chart, in-page analytics

Matrix	Key performance Indicators (KPIs)	Description	Matrix value	Visual
		and individual pages	page, bounce rate, percentage of exit	
	Navigation	Sequence of user interactions with the website content	Landing page 1 st and 2 nd interaction page, exit page through traffic, drop-off rate	Flow report
Technology Use	Hardware	Electronic devices used to access the website	Type of device and its commercial brand, screen resolution	Pie chart
	Software	Software used to access the website	Web browser brands, and operation systems	Pie chart

The following section elaborates on the results of the google Analytics reports regarding the CPUT multilingual glossaries website.

(a) User demographics

Although the CPUT multilingual glossaries website was launched in 2016, the researcher formally introduced the platform to the students enrolled for the courses covered in this study only towards the end of 2018. Therefore, to capture the website interactions that are inclusive of this research study participants, the researcher decided to focus on the Google Analytics reports of 1 January 2019 to 31 December 2021. The total number of users who visited the CPUT multilingual glossaries website between the years January 2019 and December 2021 numbered 14,094.

South Africa alone had the largest number of visitors (13,908) during this period, making up 98% of the total number of visitors. This is not surprising as the content of the multilingual glossaries covers South African languages. However, the website

seems to have also attracted quite a number of users from other countries: the United States (42); China (40); and Netherlands (28), to name a few.

The analytics also show that the second highest language settings in the users' browser is English (South African), represented by 'en-za'. Considering that many South Africans who use computers have English (United States) set up as the default processing language in their computers, this statistic is consistent with the largest number of geographical users, which are those based in South Africa. Appendix L shows the geographical distribution and language use of users of the multilingual glossaries (MLG) website.

(b) User behaviour

Users made 17,558 visits to the multilingual glossaries website between January 2019 and December 2021. On average, users spent 57 seconds on each page visit, and visited 1.25 pages per user, resulting in a total number of 35,078 page views. Of the users, 10.7% attempted to visit the multilingual glossaries website again after the first visit. The bounce rate of 71.16% indicates the number of visits that failed to record further interaction with the visited page. Further, analysing behaviour analytics by country, the Google Analytics reports show that users from South Africa seemed to be the most enthusiastic group compared to the users from other countries represented. On average, South Africans spent more time (4:48 minutes) on the website than the rest .

In addition, Google Analytics uses the primary language from the browser settings to identify and set up Internetnetwork Operating System (ISO) codes. For example: en (English), en-us (English, United States), and en-gb (English, Great Britain). In this study, it was found that more than half (56.46%) of the users had their browsers set to English (United States); this was followed by 27.81% of users whose browsers were set to English (South Africa) . See Appendix M, showing the overview of user engagement.

The website also seems to have attracted user communities from several other English-speaking countries. While a large percentage (98.39%) of the users of the multilingual glossaries website were based in South Africa, this was followed by the United States (0.30%) and China (0.28%), see appendix N.

(c) Technology use

The following section provides information about the software and hardware that was used to access the multilingual glossaries website. Users acquired access to the multilingual glossaries website through different networks as follows:

A (not set) value in place of the actual value indicates that Google Analytics lacks information about the value or is unable to interpret it (Diachuk, Kravchenko, & Samovar, 2022). The report shows a larger number of networks as “not set”, with 9,548 users who had engaged with the MLG website. The second highest network service provider is “Cape Technikon” with 1,358 users; followed by the “Cape Peninsula University of Technology” network with 616 users; and in fourth position was the “Peninsula Technikon (pentech1)” with 404 users. All these CPUT networks are a good indication that more engagement and website activities were listed under networks provided at different CPUT campuses compared to other outside networks. Appendix R provides an overview of users’ online behaviour by network.

The most popular method used to access the multilingual glossaries was through direct access, where 14,033 users typed in a website address on their browsers. Closely following direct access was access by “Social” in the case of 22 users, representing the social network where the activity originated (in this case, Facebook). Another access method was the Google search, represented by “Organic search” in the analytics report. This method was used by 19 users. See Appendix O, showing the overview of traffic sources for online behaviour analytics.

Between 2019 and 2021, the web browsers used to access the online multilingual glossaries website were as follows: Chrome, which was used by 60.03% of users, was the most popular internet browser; Android WebView, by 18.56% of users; Safari, by 7.29% of users; Windows Edge, used by 6.98% users; and Mozilla Compatible Agent (a browser), which was used by the least number of online users (0.08%). See Appendix P, providing an overview of user technologies between 2019 and 2021.

Behaviour flow

The behaviour flow report shows the flow of traffic and how users interacted with the different pages of the multilingual glossaries website.

Appendix Q shows the behaviour flow report and in-page analytics of the top three landing pages (after the starting page). These are: Ecology (77); Applied Sciences (63); and Microbiology (60). Next are the starting pages which are displayed as the following pages: Architectural Technology; Microbiology 2; Applied Sciences; and Law of Contracts. Google Analytics does not show all the pages in the displayed format in Appendix Q but provides a “more pages” link that, when clicked, displays the rest of the landing pages.

4.7 Conclusion

In this chapter, I have presented and analysed the data that was collected in this research study. The findings of the research that relate to the research questions will be discussed in Chapter 5.

CHAPTER 5

SUMMARY OF FINDINGS

5.1 Introduction

This chapter discusses, interprets and describes the significance of the research findings. The researcher highlights differences and similarities in students' attitudes towards, and opinions about, the CPUT online multilingual glossaries platform and content across all three cases of this study.

The data from questionnaires and focus group discussions is discussed according to these different themes: Attitudes towards, and perceptions of, multilingual glossaries; Attitudes towards, and perceptions of, mother tongue; and, Suggestions for multilingual glossaries improvement.

The researcher then discusses the findings of the quasi experiments to share insights into the students' understanding of the academic concepts before and after the use of multilingual glossaries as a study aid to master their course content.

Furthermore, the data collected from the lecturer questionnaires and Google Analytics reports is discussed and interpreted to glean insights into the lecturers' perceptions of the multilingual glossaries and the online user behaviour of the students, respectively.

Although CPUT developed an online multilingual glossaries tool with hypermedia of verified subject-specific multilingual material, the impact of the CPUT online multilingual glossaries platform on student academic experiences had not been examined. This is the research problem for this study. To investigate this research problem, the study addressed the following main research questions:

- (a) What is the impact of the online multilingual glossaries platform on the academic experiences of the students selected for this study at CPUT?

The following supporting questions were also structured to bring more information in answering the main research question:

- (b) What are the students' attitudes towards, and perceptions of, the online multilingual glossaries?

- (c) How do students use the online multilingual glossaries for purposes of meaning making?
- (d) To what extent does the students' level of understanding of concepts impact on their learning?

5.2 Students' attitudes towards, and perceptions of, multilingual glossaries

The following discussion is informed by the findings from the student questionnaires and the focus group discussions. The questionnaires were divided into two sections: one that focused on the use of the multilingual glossaries platform; and the other that focused on the language of the content in the glossaries. Findings from the focus group discussions for all three cases (subjects) included both positive and negative experiences of participants. There were also recommendations for future improvements of the multilingual glossaries platform. The findings in this section are derived from the students' responses, ranging from the accessibility of the online multilingual glossaries platform, what students found useful about the platform, what students liked least about the platform, the students' perceptions about the languages used in the multilingual glossaries, the look or appeal of the multilingual glossaries platform, and the frequency of website visits by the students.

Findings

Most participants expressed their satisfaction about the accessibility of the multilingual glossaries website, noting the ease of using the website anywhere and at any time they needed. Some participants emphasised the convenience of being able to access and use the multilingual glossaries website when not on the CPUT campuses as a positive experience. This links with McGuinness and Vlachopoulos's (2019) statement that students become more motivated and involved in the learning process and are more likely to become lifelong learners if they can observe how their changing needs are being fulfilled. According to Whiteside et al. (2016), digital technology can act as a catalyst for the development of more engaging learning environments.

A few participants raised their concerns about the lack of data and internet connection when they are off campus. Some students also mentioned that they would also like off-line access to the multilingual glossaries. This is, however, already catered for, as all the multilingual glossaries online can also be downloaded in pdf format.

The participants were mostly excited about and enjoyed the function of switching from English to African languages in the multilingual glossaries platform, stating that this feature was the most useful on the platform. Another significant number of participants found the voice-over options of the multilingual content useful for facilitating ease of learning of their course concepts.

Opportunities for online education are always growing. Students and instructors have more tools at their disposal to improve and broaden classroom activities. The resources that teachers have access to in their classrooms or in the school library are no longer their only options (Yuhanna, Alexander & Kchik, 2020).

It was a good discovery that most participants accessed the multilingual glossaries website a few times in a week, despite the glossaries not being an official credit-bearing resources and there was no official time allocated in the course schedule for students to use the multilingual glossaries.

The perceptions about languages were very mixed. The participants expressed various emotions, from excitement, passion, and disappointment. Generally, participants were excited about the use of African languages in their causes. Most isiXhosa speaking participants were proud to see isiXhosa being used as a language to teach academic concepts; however, some were concerned about the level of isiXhosa language used, mentioning that, in their daily vocabulary, they did not usually use certain words found in the multilingual glossaries, they found the words to be more formal than what they were used to.. The Afrikaans speaking participants were happy about the level of their language and showed general excitement over the simplicity of the Afrikaans definitions. Both Afrikaans and isiXhosa participants were happy with the retained English concepts and definitions in the multilingual glossaries. Koch and Burkett (2005:1091) claim that African language speakers in South Africa show a strong preference for mother tongue instruction, provided that it provides high-quality L1 education.

The study also found many participants who mentioned their disappointment at the limited number of languages represented in the multilingual glossaries, referring to there being English, Afrikaans and isiXhosa only. Most participants expressed their wish for the inclusion of all South African official languages, while others were advocating for all African languages as CPU has a diverse student community from

all over Africa and globally. The researcher always made time to explain to the participants that the reason for prioritising only three languages was based on a decision to start the glossaries with the Western Cape regional languages first, with an intention to include other South African official languages in the future and ultimately expand to other African languages of interest to CPUT student communities.

The language matter was also a serious concern for the Law of Contract participants who expressed their need for the Latin concepts in their course to be translated into their home languages for better understanding. These findings are consistent with the view of Geduld (2019) who states that one of the key points made by the General Council of the Bar was that many black South African students were unable to attend college due to the duration of the LLB, which took six to seven years to complete before 1994. It was also thought that the need for students to complete courses in Afrikaans, Latin, and English further hampered black students' access to higher education.

Most participants agreed that the platform looks appealing to them, stating that the colours captured their attention, the navigation was user-friendly and welcomed the user to engage with the platform. These findings are validated by other researchers' findings that a website's appeal is determined by the quality of its perceptual features that generate user interaction and attract online users towards a site (Bonnardel et al., 2011). An appealing website is more likely to draw in users, encourage positive user intentions, and uphold better usability and trust standards (De Angeli et al., 2006; Parboteeah et al., 2009; Lindgaard et al., 2011; Verhagen & Van Dolen, 2011; Wells et al., 2011). Additionally, aesthetic elements of a website are crucial for attracting users online, according to Reinecke et al. (2013), who ranks website attractiveness in terms of visual complexity and colour. Aesthetic factors have been connected to behavioural intentions, online page preferences, credibility, and usability (Abdallah & Jaleel, 2014).

The participants also recommended ways of improving the online multilingual glossaries platform which included developing a phone application version of the glossaries tool, adding social media elements, and enhancing the multimedia of the platform by adding elements like animations, illustrations, and video clips.

5.3 The use of multilingual glossaries for meaning making

In this section too, the findings were derived from the student questionnaires and focus group discussions. The researcher looked at the responses concerning the level of English, Afrikaans, and isiXhosa languages used in the multilingual glossaries: how students comprehend English academic concepts and terminologies in their courses; the students' preferences and recommendations when it comes to additional study materials or resources in their home language; and students' concerns about understanding of their course content.

While there was a significant number of participants who were happy about the simplified level of the languages used in the glossaries, some participants found the level of both Afrikaans and isiXhosa languages difficult to understand in the multilingual glossaries. This is despite a good number of students representing all three languages concerned during the process of verification of the translated concepts. These students were currently enrolled at the time and included some postgraduate students for the course for which the pertinent subject glossary had been developed. The role of the students in the verification process was to help make texts accessible by addressing language and other barriers by recomposing content using a different linguistic tool; and to participate and provide possible solutions on ways to alleviate misconceptions. Some researchers attest that language has long been recognized as a barrier to student success, especially when monolingualism is dominant (Webb, 2009; Makalela, 2016).

Many participants agreed that they needed to translate English concepts into a language that they understood better, both while in class during a lecture and when they studied on their own. This is closely related to the view of Mackenzie (2009) who believes that there is an increasing body of educational research evidence showing that successful educational programmes start with the child's familiar environment and eventually progress to the unfamiliar. Children learn best when they start with the familiar and work their way up to the unexpected; concepts must be grounded in their immediate surroundings and past experiences. Children should be taught in the language they use to think.

Most respondents across the three subjects in this study, recommended the use of African languages in higher education. They further agreed that they needed additional

study resources in their home languages. Koch and Burkett (2005) mention "globalisation and empowerment at a conceptual level" as a benefit of using African languages in the South African higher education context. According to Zikode (2017), one of the advantages of using African languages in higher education is the development of these indigenous African languages as scientific languages and for use as mediums of instruction. Additionally, Makhanya and Zibane (2020) state that there are advantages to using one's own language, including ease of expression, to boost one's self-confidence and develop a feeling of inclusion.

Some highly recommended multilingual study materials include video clips, lecturer notes, past papers, practical assessments, audio recordings of lectures or lecturers explaining concepts, and subject-specific dictionaries. Participants also expressed their concern about understanding their course content, citing heavy workloads, difficult Latin concepts (from Law of Contracts), and difficult concepts and terminologies. In the South African context, some of the popular multilingual online study materials in higher education include: multilingual online terminology lists that can be found in a multilingual environment of the Department of African Languages; open educational resources at the University of South Africa (UNISA) (Kosch & Bosch, 2014); subject-specific multilingual glossaries, text books, study guides, multilingual courses, course outcomes, and assessment criteria (Pearson, 2002; Madiba, 2004; Maseko, 2014; Ngcobo, 2014).

5.4 The degree to which students' level of understanding of academic concepts impacts their learning

This section is informed by the quasi-experimental scores, and the students' preferred learning modalities.

Students from all three cases, Foundation of Nursing Practice, Horticulture 1 and Plant Material Studies, and Law of Contracts, produced better multiple-choice scores on the post-test exercise. This is an indication that the intervention of the multilingual glossaries provided an opportunity for better understanding of course concepts, leading to better scores than on the pre-test before students were given time to use the multigoal glossaries.

The study found that students from the Foundation of Nursing Practice understand course materials better when they see them, such as in audio visual formats like video clips. An increasing number of researchers support the growing use of videos in higher education, confirming that videos are used to assist students with content that is factual, conceptual, or procedural (Winslett, 2014).

Tan and Pearce (2011) agree that using videos in higher education provides flexible learning opportunities (Anderson & Ellis, 2001; Harrison, 2020). Fyfield et al. (2019) further attest that videos have much potential as a powerful medium for conveying information and for facilitating the evolution of instructional practices.

Horticulture 1 and Plant Material Studies students prefer hearing the content, that is, they prefer audio formats, like voice-overs or podcasts. According to Goldman's (2018) research, audio media such as podcasts have the potential to improve a number of aspects of education when used effectively. For example, they can help teachers come up with new classroom activities and improve teacher readiness and preparation. They can also provide students with a range of learning advantages both inside and outside the classroom to help them learn.

The Law of Contract students understand course materials better when they read the content. During the course of the research study, the students highlighted their challenges with reading and understanding Latin terms, and some students requested that the Latin concepts and terminology also be translated into English, Afrikaans, and isiXhosa in the future of the multilingual glossaries. Understanding legal situations is one of the most important skills for law students to thrive in their career. Given that case law is one of the main sources of law, it is very important, according to Ariffin and Asraf (2014). According to Christensen's 2007 research, pupils who can understand legal judgments fast and accurately perform better academically.

Furthermore, students generally now have access to more inclusive learning settings, thanks to technology that considers different learning preferences (McGuinness & Vlachopoulos, 2019).

5.5 Findings: Lecturer questionnaire

The lecturers were generally supportive of the study. There was more excitement and support from the Law of Contracts lecturer as they had a similar project of translating course terminologies from English into Afrikaans and isiXhosa in the Applied Law Department. They disseminated the translations in hard copy formats to their enrolled students. The Horticulture 1 and Plant Material Studies used the multilingual glossaries in class projects and assignments and awarded marks to the students. The Foundation of Nursing Practice lecturer highlighted that this department exercises some multilingual teaching and learning practices, such as they allow students to use the multilingual glossaries during their interactive lecture periods, where students are allowed to answer questions and clarify certain concepts using their home languages. There was general agreement from all lecturers that language is a barrier to learning academic concepts for students for whom English is not a first language. Lecturers also highlighted that language plays an important role in teaching and learning of academic concepts; students must therefore be encouraged to use their mother tongue to learn and understand their course content.

When lecturers were asked for their opinion on the impact of the online multilingual glossaries on the academic experiences of your students, they mentioned the enhancement of understanding of concepts, improved confidence, student language development support, and opportunities to exercise critical thinking for learning. In order to benefit the students and ultimately cultivate their success in mastering their course content and opportunities to exercise critical thinking for learning, this suggests that there is good support for and understanding of the importance of using students' first languages for teaching and learning, even if those languages are not English.

5.6 Findings: Google Analytics

According to a comparison of online analytics solutions, Google Analytics is the best option because of its effective features, the benefits of open source, and free accessibility (Chande, 2015). Google Analytics was not set to follow only research participants that engaged with the platform. However, it is evident from the Google Analytics reports provided for this study that there were sufficient activities indicating engagement with the CPUT online multilingual glossaries website. The website visitors from South Africa and within the CPUT set networks showed a strong presence compared to those from outside countries and networks. This is a good indication that

more CPUT users, including the participants, engaged with the platform on a regular basis.

The study found the “not set” networks comprised the majority of users, which means that Google Analytics did not receive any valid information for the dimensions that were selected to produce the “Networks report”. To prevent compromising the data insights of the reports, Google Analytics must be improved to identify the “not set” values and determine which ones require action as a crucial component of website maintenance.

5.7 Limitations of this study

The first limitation is that this study included only three departments at CPUT. The second limitation is that lecturers were difficult to access for meetings and communication by email often resulted in delayed responses because of their busy schedules and heavy workloads. The final limitation was that the students from the Foundation of Nursing Practice and Horticulture 1 and Plant Material Studies were engaged in many off-campus practical and service activities most of the time and, as a result, there were many revised meeting schedules as the research activities depended on the students’ availability.

The limitations I have highlighted seem to resonate with Jonker’s study (2016:?))

If the multilingual glossaries are not a part of an integrated teaching and learning approach, they may not necessarily promote proactive knowledge. If they cannot be put into practice without institutional support from the larger university and the particular discipline, they will not necessarily be sustainable. Lastly the translated technical terminology won't be helpful and believable in a disciplinary context if the translation of technical terminology is not a collaborative effort involving professional translators who are mother tongue speakers and discipline specialists.

5.8 Conclusion

This chapter summarised the findings and presented limitations of the study. The research study has found the use of the online multilingual glossaries platform to have had a positive impact on the first-year students’ academic experience at CPUT. Students were accepting of, and excited to use, the multilingual glossaries platform. Their willingness to learn academic concepts using mother tongue was confirmed;

however, this willingness was also accompanied by concerns about the use of mother tongue to learn academic concepts while the assessments and final exams are expected to be written in English only. Furthermore, students expressed their need for the inclusion of other African languages to be part of the CPUT online multilingual glossaries.

The quasi-experiment findings in all three cases of this study revealed that the level of understanding of academic concepts improved after the use of the multilingual glossaries.

Some key findings of the research:

- (a) The study found similarities in the need for multilingual study materials and representation of other African languages across the three cases in this study.
- (b) In terms of the language needs, the Law of Contracts students showed more concern about the lack of Latin translated concepts.
- (c) The multilingual glossaries platform provides a positive opportunity and space for students to learn academic concepts in their home languages.
- (d) All three cases showed different preferences in study modalities for the course content, including traditional reading, audio recordings, and video clips.

Chapter 6 will draw some conclusions and present recommendations of the study.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

As the overall context for the current study, Chapter 1 provided background on the South African medium of instruction in many of our universities as being mainly English only, followed by Afrikaans as an additional language at a few universities, with few to no universities using African languages as mediums of instruction, despite all of the latter languages also being official languages of the country. A related point to this is the use of multilingual glossaries as an aid to support the learning and mastery of difficult academic terminologies and concepts using students' mother tongue. Studies about the development and use of multilingual glossaries were reviewed. These showed that there were many positive outcomes of integrating and using multilingual glossaries of academic concepts in different courses in South African universities. The impact of some of these outcomes on student success in their academic courses was subsequently discussed. Then, with particular reference to the usage of the online multilingual glossaries platform to enhance the academic experience of first-year students in the Applied Law Unit, the departments of Horticultural Sciences, and Nursing, the impact of using multilingual glossaries at CPUT was discussed. This is also the purpose of the study: to determine the impact of the online multilingual glossaries platform and its contribution to the academic experience and success of the students.

It is important to remember that, while the current study did not include all the first-year students enrolled at CPUT, other first year students would be likely to benefit from the findings and recommendations of the study.

In the literature review, it was important to pay attention to the idea of Cummins's conceptual framework which distinguishes between two types of English language proficiency: Basic Interpersonal Communication Skills (BICS) and Cognitive Academic Language Proficiency (CALP), to understand language proficiency in the mother tongue (L1) and the second language (L2) in relation to academic performance. In addition, cognitive semiotics was briefly discussed to provide insight into the significance of the translation and verification processes in the linguistic meaning making experiences of students. The role of the students in the verification of the

multilingual glossaries was to remove obstacles caused by language and other factors by recomposing information using new language tools, as well as to take part in efforts to provide solutions on how to clear up misconceptions.

A mixed methods design (as described in Chapter 3) was chosen to address the research problem and research questions that arose from the need to determine the impact of the online multilingual glossaries platform on the academic experience of students at CPUT. The qualitative part of the study provided explanations of the opinions and perceptions of the online multilingual glossaries content and its platform, based on the experience of the students who were using the platform. The quantitative part of the study also provided insights into the quantifiable findings on the impact of the multilingual glossaries platform on the academic experience of the selected students. This was demonstrated by improved multiple-choice exercise scores and mean percentage outcomes based on the post tests in the quantitative study's quasi-experiments.

In Chapter 4, two sets of data from the qualitative study's focus groups and questionnaires (students and lecturers) were analysed. Students, overall, seemed excited and open to the idea of using their mother tongue to learn academic concepts; and further, they recommended the use of African languages in higher education. Students were also concerned about the other African languages that were not represented in the online multilingual glossaries at CPUT. Additionally, some students were concerned about the level of Afrikaans and isiXhosa in the multilingual content, mentioning that they did not use some of the words in their daily vocabulary because they seemed more formal than the words they use on a regular basis.

The lecturer questionnaires confirmed a view point that the English language was a barrier to learning the academic concepts, as well as the need for further language support and mother tongue teaching and learning resources, especially for students for whom English is not a first language.

The quantitative data sets comprising the quasi-experiment findings and Google Analytics reports were also part of the data analysis in Chapter 4. The mean percentages for the pre-tests were statistically compared to the mean percentages for the post-tests in each of the three cases in the quantitative study. The mean

percentages showed that the multiple-choice scores improved after the use of the multilingual glossaries platform in all three cases of the study. According to the findings of the qualitative analysis's quasi-experiments, the first-year students who were chosen for this study appeared to benefit academically from their exposure to the multilingual glossaries platform.

The Google Analytics report showed significant engagement with the platform between January 2019 and December 2021. Amongst the key findings on these reports was that several CPUT networks confirmed user activities and behaviour that indicated the following matrices: time and efforts spent on the multilingual glossaries website (through page views, unique views, average time spent on pages, and the bounce rate); access by location points (showing country, and network location points); machine language set-ups (mostly South African English with the code: "en-za"); source of traffic points (showing access through referral sites/direct URL inputs/organic unpaid search links); and behaviour flow which showed the navigation tendencies of the users when engaging with the website. All these activities and the report statistics are reasonable indicators that the platform was indeed used during the period of this research study.

This study evaluated the impact of the online multilingual glossaries platform on the students' academic experiences and success at CPUT. Based on student comments and improved multiple choice scores following usage of the online multilingual glossaries platform, it can be concluded that the study findings support the use of multilingual glossaries in higher education and provide students with a positive learning experience.

6.2 Recommendations of the study

- (a) The development of subject-specific multilingual glossaries should be expanded to other academic programmes and eventually become an integral part of all subjects and disciplines at CPUT.
- (b) The multilingual glossaries platform should be enhanced to include the features that were recommended by the students (including adding more languages but prioritising South African official languages) to promote user engagement and satisfaction.
- (c) The development of an application (App) for the CPUT multilingual glossaries.

(d) Further investigation and experimentation on the use of the existing CPUT online multilingual glossaries in class to date is strongly recommended.

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