

**Educational Subtitling: Perceived Value, Student Viewing
Patterns, Plain English, and Multilingual Initiatives in
Higher Education**

by

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Vir Pappa

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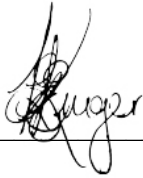
I would also like to thank my wonderful husband, Thomas, for his constant support through all my studies.

DECLARATION

I hereby declare that

Educational subtitling: perceived value, student viewing patterns, plain English, and multilingual initiatives in higher education

is my own work and that all the sources I have used have been acknowledged by means of complete references.



E. Kruger-Marais

23/06/2023

Date

ETHICS STATEMENT

The author, whose name appears on the title page of this dissertation, has obtained, for the research described in this work, the applicable research ethics approval.

The author declares that she has observed the ethical standards required in terms of the University of Pretoria's code of ethics for researchers and the policy guidelines for responsible research. This study was approved under clearance number 13062418 (HUM015/0121). Clearance was granted on 19/09/2021.

PERMISSION STATEMENTS TO SUBMIT ARTICLES FOR EXAMINATION PURPOSES

I, H. C. Kruger-Roux, co-author of the article listed below, hereby declare that the input and effort of E. Kruger-Marais in writing these articles was of sufficient scope to be a reflection of her own efforts. I hereby grant permission that she may submit these articles for examination purposes, in partial fulfilment of the requirements for the degree Philosophiae Doctor in Applied Linguistics.

- Perceived usefulness of academic English, plain English and keyword English educational subtitles among students in the Natural and Agricultural Sciences Faculty from an intralingual perspective (Chapter 1).



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PERMISSION STATEMENTS TO SUBMIT ARTICLES FOR EXAMINATION PURPOSES

I, P. A. Cooper, co-author of the article listed below, hereby declare that the input and effort of E. Kruger-Marais in writing these articles was of sufficient scope to be a reflection of her own efforts. I hereby grant permission that she may submit these articles for examination purposes, in partial fulfilment of the requirements for the degree Philosophiae Doctor in Applied Linguistics.

- Academic versus plain English word lists: The development of parallel word lists for undergraduate students in the natural and agricultural sciences (Chapter 3).

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ABSTRACT

This study explores the multifaceted aspects of educational subtitling in higher education, focusing on its perceived value, student viewing patterns, the use of plain English, and its application in multilingual initiatives. Educational subtitling has gained recognition as a valuable tool for enhancing learning experiences and improving accessibility for diverse student populations. The study investigates the perceived value of subtitling among students and instructors, examining its impact on comprehension, engagement, and overall learning outcomes. Furthermore, it explores the viewing patterns of students in relation to subtitled educational content, analysing factors such as gaze duration, recall, and preferred viewing language.

In addition, the study investigates the effectiveness of plain English in educational subtitling, addressing the challenges and benefits of using simplified language to promote better comprehension. The study explores how plain English subtitling can contribute to inclusive education. Moreover, the study explores the implementation of multilingual initiatives in educational subtitling, examining the potential of providing subtitles in multiple languages to cater to diverse student populations and promote language learning. The study further explores how selected South African universities employ subtitling and other technological innovations to promote multilingualism in keeping with the 2020 language policy of the Department of Higher Education and Training (DHET).

In terms of its contribution, the study has the potential to enrich existing research by offering empirical data and insights that can inform educational practices, instructional design, language learning strategies, and accessibility initiatives. It contributes to the ongoing discourse on how technology and language resources can improve education, especially in specialised fields, and addresses the diverse linguistic needs of students in higher education. Additionally, the case study approach used offers a context-specific perspective that can enhance the practical relevance of the findings to educators, administrators, and policymakers in the field of education. The case study used in this research is based on students at the University of Pretoria (UP) and its new language development implementation plan, and the study therefore gives insight into the use of subtitles at UP, specifically.

To conduct this research, a case study approach is employed, involving questionnaires, focus group interviews, document reviews and analysis of viewing patterns. This case study is university-specific and is based specifically on findings from students at UP. The data collected from students provide insights into the perceived value of educational subtitling, the factors influencing viewing patterns, and the efficacy of plain English and multilingual initiatives. The findings of this study contribute to a deeper understanding of the role of educational subtitling in higher education and provide practical recommendations for its effective integration into teaching and learning environments.

KEY TERMS

Academic mediation

Technology

Academic vocabulary

Undergraduate students

Accessibility

Video learning

Cognitive effectiveness (to be distinguished from cognitive theory, which is not the focus of this study)

Word list

Department Of Higher Education and Training

Eye-tracking

Gaze duration

Higher education

Inclusivity

Language accessibility

Language inclusivity

Language policy

Multilingualism

Plain English

Reception

Subtitles

Subtitling conventions

Technical terms

LIST OF ABBREVIATIONS

CPUT: Cape Peninsula University of Technology

DBE: Department of Basic Education

DHET: Department of Higher Education and Training

HL: Home language

L1: Home language

L2: Second language

LLM: Large language model(s)

NAS: Natural and Agricultural Sciences

NESB: Non-English speaking backgrounds

NWU: North-West University

OERTB: Open Educational Resource Term Bank

SLS: Same language subtitles

UFS: University of the Free State

UP: University of Pretoria

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Chapter 1: Introduction: Educational subtitling: perceived value, student viewing patterns, plain English, and multilingual initiatives in higher education

1. Introduction

Educational subtitling, or providing subtitles or captions for educational videos, lectures, and online courses, has gained increasing attention in recent years to enhance accessibility and inclusivity in educational contexts. By bridging language barriers and accommodating diverse learners, educational subtitling holds great potential for improving comprehension, knowledge acquisition, and overall learning outcomes (Vanderplank, 1988:275, d'Ydewalle and Pavakanun, 1995:51, d'Ydewalle and Van de Poel, 1999:228, Koolstra and Beentjes, 1999:52, Bird and Williams, 2002:509, Williams and Thorne, 2000:220, Danan, 2004:68, Díaz-Cintas, Matamala and Neves, 2010:11). This thesis by publication aims to examine the perceived value of educational subtitling, its impact on cognition. As a means of improving accessibility and diversity in educational contexts, educational subtitling has attracted growing interest in recent years. Educational subtitling holds immense potential for improving comprehension, knowledge acquisition, and overall learning outcomes by addressing language barriers and accommodating multicultural students. This study examines initiatives supporting multilingual subtitling in educational contexts, as well as the perceived value of educational subtitling, its effects on cognition, the importance of register in subtitling and its perceived usefulness. The study contributes towards enriching teaching and learning, as well as advancing multilingualism in South African higher education.

The study focuses on the role of subtitling in driving teaching and learning, particularly in addressing the language question. By using subtitles in multiple forms, educators can create an inclusive learning environment where students with different language backgrounds can fully engage with course materials. This approach not only promotes multilingualism but also enhances comprehension and accessibility, ultimately encouraging a more equitable and effective educational experience for students.

1.1 Background and rationale

Effective communication across languages and cultures is essential in today's interconnected and globalised world. Language difficulties frequently impair knowledge transfer, especially in contexts where learning settings place a premium on student comprehension and

participation. In order to access instructional content in students' original languages or the languages they are adept in, educational subtitling acts as an academic mediation tool for audio-visual material. Subtitles in instructional content can help students of all linguistic backgrounds improve their comprehension, overcome language barriers, and encourage fair learning opportunities.

1.1.1 Educational intervention needs: student, educator and researcher views

The Constitution initially viewed multilingualism as mandatory in educational institutions and other government contexts (Olivier, 2011). However, this was superseded by a call to use languages other than English, starting with basic education, as universities established English as their medium of instruction (MOI) (Antia, 2015, Benson, 2018, Hungwe, 2019, McNamee and Rule, 2019). The Department of Higher Education (DHET) also announced a new language policy simultaneously, emphasising the universities' obligation to be language inclusive in addition to the insufficiency of efforts in this field over the past twenty years (DHET, 2020:12). Plain English and keyword subtitles may contribute to overcoming these challenges to language inclusion.

South Africa faces significant challenges in basic education and literacy. While efforts have been made to improve access to education and literacy rates, several issues still need attention (Spaull & Pretorius, 2019:147). Low literacy rates remain a concern for South Africa. Only 19% of South African Grade 4 learners can read for meaning, according to Progress in International Reading Literacy Study (PIRLS) (Department of Basic Education, 2023:7), underlining the need for development in reading literacy.

The International Association for the Evaluation of Educational Achievement (IEA) administers the PIRLS, a global test measuring and comparing students' reading literacy abilities across countries. Learners in Grade 4 participate in the assessment, which evaluates their reading comprehension skills and practices. PIRLS offers useful insights and statistics about student reading literacy levels, instructional methods, and variables influencing learning performance at a basic education level (Department of Basic Education, 2023:1).

The results from the latest PIRLS report have implications for educators and researchers in higher education as well, including the difficulties which students with already low literacy levels are likely to experience in achieving the academic requirements of higher education.

Students' literacy difficulties may begin in primary school, but they often carry over into their tertiary education because there is no "...particular culture which [is] inculcated in [children and students] to focus on reading" (Nodada, qtd. in Mbinqo-Gigaba, 2023, n.p.). Higher education places a premium on reading comprehension, critical thinking, and written communication abilities, and students with inadequate literacy skills may find it challenging to keep up with their studies (Webb, 2002:196).

Subtitles are one example of an educational intervention that can help bridge the literacy gap between basic and higher education. The visual depiction of spoken words in subtitles helps learners connect the text to the audio. This can help students who struggle to decode or comprehend difficult words or those with weaker literacy levels to read more effectively (Mahlasela, 2012:12). By bridging the gap between spoken and written language, subtitles make it easier for students to follow along during their classes.

1.1.2 Language equalisation

Not much has come of the equalising of languages and the social aspects they provide access to, as envisioned by struggle stalwarts (Alexander, 1989:47). Some factors which contribute to this include the lingering impact of apartheid, limited resources, failure to recognise South Africa's linguistic diversity, debates over the need for a lingua franca, and societal attitudes towards language and language policy.

A comprehensive and multifaceted approach is needed to accomplish the struggle veterans' aim of equalising languages in South Africa. Strategies which can contribute to its successful implementation (some of which are discussed in more detail in this collection) include the following:

Firstly, legislation and policies that support language equality and preserve linguistic rights should be implemented. This entails ensuring that all official languages are treated equally and given attention in various contexts, including education (Alexander, 1997:87).

Secondly, multilingual education that recognises and promotes the use of native languages in educational settings should be encouraged (Alexander, 1997:86). It is essential to create inclusive curricula that reflect the linguistic and cultural variety of South Africa (Webb, 2002:203). In order to maintain equal access to educational content across diverse linguistic

communities, the development of materials and resources in various languages should also be encouraged.

By implementing these strategies and fostering a society that values and supports linguistic diversity, South Africa can work towards realising the vision of struggle stalwarts and achieving greater language equality and social access for its citizens.

1.2 Key concepts

This section explores the underlying principles and theoretical frameworks necessary for understanding and analysing the topic of this study. The goal of this section is to give a review of the fundamental concepts that guide the current study. This section establishes the framework for the further analysis and exploration of this study by examining key themes, theories, and methodologies, ensuring a foundation for understanding the research.

1.2.1 Media access and accessibility studies

Accessibility studies involves investigating accessibility mechanisms and behaviours, as well as developing, executing, and analysing approaches that are accessibility-based and accessibility-oriented (Greco, 2018:205). Media accessibility studies is a term which was originally developed under the umbrella of audio-visual translation (Greco, 2018:211). The focus of audio-visual translation is the transference of multimedia and multimodal content into other languages and/or cultures (Pérez-González, 2008:13, qtd. in Greco, 2018:211). Media accessibility has since been expanded to include “...not only sensory but also linguistic barriers [and later] ...access to media products, services, and environments for all persons who cannot, or cannot completely, access them in their original form” (Greco, 2018:211). Subtitling is one of the ways in which media accessibility through audio-visual translation can be accomplished, making these important concepts to mention in the context of this study.

1.2.2 Previous studies on educational subtitling to promote various forms of access

This section will examine previous studies that have explored the use of specifically educational subtitling to promote various forms of access. In educational settings, subtitling has become vital for enhancing access to audio-visual content. Previous studies examined

various subtitle-related topics, such as how they affect language learning, understanding, and engagement. By reviewing these earlier studies, the advantages and difficulties of using subtitling to increase access can be highlighted, shaping future research and practical applications in educational settings.

1.2.2.1 International subtitling studies

Subtitle reception is a relatively new field of study in subtitling (Perego, Laskowska, Matamala et al., 2016:222). The crucial problem of accessibility is also addressed by Gambier (2018:55) concerning subtitle reception. Gambier notes a few accessibility considerations that should be made in both SLS and translated subtitles (which affect viewer response). These qualities include language compliance, readability (cognitive load), legibility (font selection, screen location, and subtitle speed), synchronism, and the importance of the information displayed on the screen (Gambier, 2018:55).

Research by Perego, Laskowska, Matamala, Remael, Robert, Szarkowska, Vilaró, and Bottiroli (2016:219) set out to ascertain whether watching subtitled content was more complex and less rewarding for audiences who are not regular users of subtitles, and if subtitling provides more advantages to those who are accustomed to subtitles (2016:219). This research found that engaging with subtitled content is cognitively effective and that viewers who engage with the subtitled content perform well when tested on word-related abilities after watching the subtitled content (Perego et al., 2016:220). According to Perego et al. (2016:206), cognitive effectivity is the ability to recognise and understand certain types of content. The research highlights the advantages of subtitled content, especially in a learning environment, and Perego et al. advise further investigation to ascertain if these beneficial outcomes can be repeated in other contexts (2016:220).

Perego, Del Missier, Porta and Mosconi (2010:243) also investigate how processing subtitles while watching audio-visual content impacts cognition. The study examines the effects of subtitles on reading behaviour, comprehension, and attention allocation using experimental research and eye-tracking techniques (Perego et al., 2010:243). The results imply that subtitles can improve cognitive functioning by gaining viewers' attention, aiding text processing, and encouraging information integration. The study also shows that the processing and comprehension of subtitles can be influenced by elements like subtitle presentation speed, language proficiency, and viewer characteristics (Perego et al., 2010:262). Overall, the study

expands the existing knowledge of the cognitive processes involved in processing subtitles and emphasises the potential advantages of subtitles for improving audio-visual content comprehension.

Lastly, Szarkowska, Díaz-Cintas and Gerber-Morón explore the perceptions and opinions of both professional subtitlers and viewers regarding the quality of subtitling (2020:661). Through interviews and surveys, the study investigates various factors contributing to the perception of quality in subtitling, including accuracy, readability, timing, and cultural adaptation. The findings reveal that both subtitlers and viewers have different perspectives on what constitutes quality subtitling, with subtitlers emphasising linguistic accuracy and technical proficiency, while viewers prioritise readability and naturalness (Szarkowska et al., 2020:673).

1.2.2.2 African and South African subtitling studies

Studies on educational subtitles have drawn considerable attention in Africa, and particularly in South Africa, to promote inclusive and equal access to education. Africa presents particular difficulties in ensuring that educational resources are accessible to students from different language backgrounds due to its complex linguistic landscape and multilingual population. Including written text alongside audio-visual content through subtitles has emerged as a potential approach, improving understanding and overcoming language barriers. Studies on using educational subtitles in promoting linguistic diversity, academic success, and language learning have been carried out throughout Africa and South Africa.

In Africa, specifically Cameroon, Ayonghe (2009:iii) explored how providing subtitles in academic lectures and materials can enhance students' comprehension, language skills, and overall academic literacy. The research examined the perceptions and experiences of students and educators regarding the efficacy of subtitles in enhancing academic literacy through a combination of qualitative and quantitative approaches, including questionnaires, interviews, and language competency evaluations (Ayonghe, 2009:82). The results show that subtitling helps students understand complex academic material, especially for those with limited English language skills. Additionally, the study found that subtitles enhance vocabulary learning, reading proficiency, and overall engagement. The study emphasised the importance of using subtitles as a realistic and affordable strategy to assist academic literacy initiatives and advance inclusive education in settings where language obstacles may restrict students' ability to learn efficiently (Ayonghe, 2009:174).

Initial studies on subtitling in South Africa focussed on the benefits of subtitling for improving literacy and multilingualism, as well as the training of subtitlers as part of a language practice curriculum (Kruger 2004:1; Kruger & Kruger 2004:111; Kruger 2005:434; Kruger 2008:72). Kruger (2004:1) concentrated on defining the parameters for the tertiary training of subtitlers in South Africa. The research sought to create a thorough curriculum that would provide aspiring subtitlers with the abilities and information required to be successful in the profession (Kruger, 2004:7). The research stressed the significance of comprehending the cultural and linguistic intricacies particular to South Africa through a combination of theoretical lectures, practical exercises, and real-world projects. In order to give students a complete understanding of the field, the curriculum included modules on translation methods, subtitling software, audio-visual analysis, and quality control procedures. The study concluded that integrating theory and practice in tertiary subtitler training in South Africa is crucial for creating knowledgeable professionals who can successfully bridge the gap between languages and cultures through high-quality subtitling services (Kruger, 2004:101).

Additionally, Kruger & Kruger (2004:111) aimed to identify the particular requirements and expectations of subtitle users, including those who are deaf or hard of hearing non-native English speakers and viewers with varying literacy levels. The study investigated readability, accuracy, language skill, and cultural relevance in subtitling (Kruger & Kruger, 2004:114). The results made clear how necessary it is to consider user preferences and requirements while training subtitlers. According to the study's findings, it is essential for South African subtitler training programmes to include user-based parameters in order to produce subtitles that cater to a variety of viewers, ensure accessibility, and enhance viewing experiences.

Kruger's subsequent study on subtitler training (2005:431) intended to create a curriculum for subtitler instruction in South Africa. To determine vital aspects and competencies necessary for efficient subtitling, researchers thoroughly assessed the industry standards and existing subtitling training programmes. The study identified the precise abilities, technical expertise, and practical experience required for subtitler training in South Africa through discussions with specialists and professionals in the field. The course material included modules on quality assurance procedures, cultural sensitivity, language proficiency, and translation methods. In order to ensure that students acquire practical skills and satisfy industry demands, the study stressed the significance of combining theory with practice, offering opportunities for hands-on training, and incorporating real-world projects (Kruger, 2005:434). The developed

curriculum aimed to give South African subtitlers the skills to create culturally appropriate subtitles, improving accessibility and fostering effective cross-cultural communication.

A final study worth noting in subtitler training is that of Kruger (2008:71). The research aimed to explore the benefits and effectiveness of incorporating subtitling skills into broader training initiatives. The study concluded that incorporating subtitler training as part of a general tertiary training program is valuable, providing students with a practical skill set that can be applied in various professional contexts. Still, Kruger adds that implementing this training will require thorough planning on the part of the tertiary institution (2008:87).

In terms of other South African studies on educational subtitling, Hefer (2011:7) examined how South African viewers read and comprehend subtitles in both their home language (L1) and in English as a second language (L2). The study investigated how viewers of audio-visual content navigate and process subtitles in various languages using a case study approach (Hefer, 2011:212). According to the research, viewers read subtitles in their original language more quickly and with more comprehension than they do subtitles in L2 English. The study also showed that viewers use selective reading techniques, paying closer attention to subtitles that contain new or unusual information (Hefer, 2011:212). The study highlighted the significance of taking viewers' language proficiency into account as well as the effects of subtitle language on reading behaviour and comprehension, and it provided insightful information about the difficulties and factors to be taken into account when using subtitles in multilingual settings like South Africa (Hefer, 2011:234).

Lacroix (2012:1) investigated the effects of same-language subtitling (SLS) on student comprehension in an English as an Additional Language (EAL) context. According to the research, adding SLS to educational resources significantly increased students' comprehension and grasp of English. By providing visual support and strengthening vocabulary and pronunciation, subtitling helped students understand the content by addressing language barriers (Lacroix, 2012:50). The study concluded that SLS effectively improves EAL students' understanding and language acquisition.

Additionally, Kruger, Hefer, and Matthew (2013:62) used eye-tracking technologies and dynamic audio-visual texts to analyse the effects of subtitles on cognitive load. The study used experimental research to examine how viewers' cognitive load, selective attention allocation, and information processing were affected by the presence or lack of subtitles. The results showed that subtitles could raise cognitive load because they require viewers to pay closer

attention to the text and exert more mental energy. The study did, however, also point out elements that lessen the cognitive load, such as the existence of pictures that complement aural material (Kruger et al., 2013:65). The study also emphasised the significance of taking into account individual variations, such as language proficiency and reading abilities, when analysing the impact of subtitles on cognitive load (Kruger et al., 2013:65). The study provided valuable insights into the complex relationship between subtitles, cognitive load, and audio-visual processing, offering implications for the design and implementation of subtitles in educational and multimedia contexts.

Matthew (2020:1) further explored the notion of cognitive load in relation to educational subtitles. The purpose of Matthew's study was to determine how SLS in recorded lectures impact L2 English speakers' ability to learn in online learning environments (2020:1). The study included aspects such as participant comprehension, engagement, and satisfaction when subtitles are included using a combination of quantitative and qualitative methodologies. According to the research, adding subtitles in the same language helped L2 English speakers comprehend lecture material better and lessened their cognitive load. Additionally, when subtitles were accessible, participants reported greater involvement and satisfaction with the learning experience (Matthew, 2020:2). The study underlined SLS's importance in supporting non-native English speakers in online learning environments, improving their access to educational resources, and facilitating their overall learning outcomes.

Furthermore, Kruger-Roux and Angu (2020:63) investigated the comprehension and reception of discipline-specific audio-visual texts by students in the health sciences, using both bimodal (audio and visual) and unimodal (visual only) modes of delivery. The study investigated how bimodal and unimodal presentations influence the students' comprehension, engagement, and perceived learning results through an experimental methodology. According to the research, bimodal presentations were more effective than unimodal presentations at increasing comprehension and engagement (Kruger-Roux and Angu, 2020:74). The study emphasised the value of including audio-visual components in discipline-specific instruction, especially in the field of health sciences, to maximise learning outcomes and aid students in understanding and remembering complex subject matter.

1.3 South Africa's Language in Education Policy (LiEP)

The advancement of multilingualism and equal access to education were two objectives of the Language-in-Education Policy (LiEP), which was implemented in 1997. This policy explained how learning a student's mother tongue for the first three years of school is followed by a more progressive introduction to other languages (DBE, 1997:2). From grade 4 onward, English would typically be introduced as the language of instruction and study (a process referred to as additive bilingualism).

In light of the LiEP, Heugh (1999:301) examined the historical, social, and political factors that have shaped language policies and practices in South Africa's education system. Heugh investigated the impact of language policies on educational outcomes, language diversity, and social cohesion. The findings of this study suggested that the promotion of multilingual education and the inclusion of indigenous languages can contribute to a more inclusive and equitable education system (Heugh, 1999:307).

In a critique of South Africa's LiEP, Alexander (2003:24) claimed it promotes historical injustices and the marginalisation of specific linguistic groups. He emphasised how English and Afrikaans dominate the educational system, which he argued prevents the growth and promotion of native African languages. Since non-English and non-Afrikaans speakers still frequently face challenges to education and academic performance, Alexander claimed that this language policy led to their marginalisation (2003:24). Alexander went on to question the government's inability to successfully address this problem, contending that real social and educational change in South Africa requires a more inclusive language policy that appreciates and supports linguistic diversity. In order to strengthen oppressed language communities and advance a more just and inclusive educational system, Alexander advocated for a radical change in the language used in educational policies through multilingualism (2003:16).

In its updated language policy framework, the DHET (2020:17) aims to encourage multilingualism. Higher education institutions are encouraged to create language policies that promote inclusion, improve language ability, and aid in students' academic performance. The framework promotes the use of students' home languages in addition to English as a medium of education and emphasises the need for a balanced language policy (DHET, 2020:17). In order to aid effective teaching and learning, it also highlights the necessity of language development programmes, curriculum design, and language support services (DHET, 2020:12).

1.4 Plain English as a multilingual gateway

A primary focus of the current study is the use of plain English subtitles as an educational mediation tool. By offering a clear and simplified communication style that is simple enough for speakers of different languages to understand, plain English can act as a multilingual gateway. It emphasises using straightforward, ordinary language rather than obscure jargon or technical vocabulary that might be difficult for non-native English speakers to understand (Cutts, 2020:xxiv-xxv). Additionally, plain English can support inclusive communication by ensuring that crucial information is accessible and understandable to various people from different linguistic backgrounds (Cutts, 2020:xxv).

Plain English subtitles can act as a multilingual gateway by providing concise, clear subtitles that make it easier for viewers to understand. Subtitles in plain English make audio-visual information more comprehensible by translating spoken conversation into simple English (Bernabé & Cavallo, 2021:243). As in its written component, plain English subtitles eliminate jargon, technical words, and colloquialisms that could be difficult for L2 speakers to understand. This method makes it simpler for viewers to follow along with the video dialogue, which improves their overall understanding of the material.

1.5 Educational technology: an overview

As subtitling is used in this study and other studies as a technological means of academic mediation, other technologies have also been employed at South African universities to promote multilingualism and language accessibility. Many of these studies are discussed in detail in the fourth article of this study.

After the COVID-19 pandemic, South African tertiary institutions have acknowledged the need to shift to digital or hybrid learning platforms to accommodate their students. For example, the current study forms part of ongoing research at the University of Pretoria (UP) to investigate the use of multilingual subtitling as part of educational videos for specific modules at the university (Kruger-Roux & Angu, 2020:63). The first article of the present study highlights that subtitling as a technological advancement in promoting language accessibility has shown great promise, and subtitles have generally been well received by students as a linguistic intervention.

At UP, many texts are digitised to produce electronic resources for African languages (Taljard, Prinsloo, & Goosen, 2023:n.p.). For example, this entails digitising audio files and scanning documents (including error correction and text cleaning). This process makes electronic materials accessible in underrepresented African languages (Taljard, Prinsloo, & Goosen, 2023:n.p.).

As a technological tool for linguistic accessibility, the North-West University (NWU) has also been concentrating on using subtitles (Hefer, 2011:1; Lacroix, 2012:5; Kruger, Hefer & Matthew, 2013:65; Matthew, 2020:2). Lacroix's research (2012:1) focuses on the effects of SLS on understanding by L2 students in a South African. As previously mentioned, Hefer's research (2011:8) focuses on attention allocation and L1 and L2 subtitle reading as determined by eye-tracking. Kruger et al. (2013:65) consider how subtitles affect viewers' visual focus, while Matthew (2020:2) investigates how SLS impacts non-native speakers of English in South Africa.

The Autshumato Machine Translation Web Service, created by the Centre for Text Technology (CTexT), has also been the subject of research at NWU, particularly in the context of South African languages (Skosana & Mlambo, 2021:1). This study argues that adding specialised parallel corpora from different fields for each of South Africa's official languages can improve the output quality of the Autshumato Machine Translation Web Service. In keeping with the inclusive nature of the DHET's language policy, this research seeks to strengthen the Autshumato Machine Translation Web Service system to make it a more usable translation tool for all of South Africa's official languages (Skosana & Mlambo, 2021:2).

Skype and Zoom have been implemented as educational mediation tools amid the COVID-19 pandemic, including translanguaging. Specifically in tutorial sessions for undergraduate students, research at the University of the Free State (UFS) focuses on how translanguaging may be used as an instructional method to support policies of multilingualism in higher education (Motaung, 2021:88).

Additionally, CPUT researchers have been focusing on translanguaging to increase students' engagement with course material (Nakhoda & Paxton, 2021:40). According to this study, translanguaging is a more comprehensive method of encouraging student engagement, particularly in the sciences. The study asserts that translanguaging is a vital, identity-affirming tool for students to improve their comprehension of the course content and to feel more in control of their learning environment (Nakhoda & Paxton, 2021:42).

Additionally, research has been done at CPUT to determine whether disciplinary content alignment with academic literacy courses at the institution encourages multilingualism and language decolonisation (Obi, Ticha & Nakhooda, 2021:61). The use of this strategy has been found to improve students' learning since students felt that their language demands were met.

Most recently, South African universities have been investigating large language models (LLMs) and their possible educational implementation. LLMs use deep learning methods to grasp, create, and use language that is coherent and appropriate for the given context (Mhlanga, 2023:8). LLMs are trained using vast databases of written material, including books, articles, webpages, and other sources of human knowledge. They learn to recognise linguistic relationships, structures, and patterns in the data, which enables them to produce writing that resembles human language (Mhlanga, 2023:2).

These models can respond to queries or prompts, understand and produce text in various languages, and carry out various linguistic tasks, such as sentiment analysis, summarising and translation, which shows potential for implementation in educational settings (Mhlanga, 2023:6).

1.6 Problem statement

The problem addressed in this study is the lack of comprehensive understanding regarding the perceived value and impact of educational subtitling in higher education. Although educational subtitling has been used in various contexts, more research is needed to determine how students view this mediation method and how it affects their viewing habits. In the context of higher education, plain English and multilingual initiatives in educational subtitling have received little attention. As a result, this study aims to examine the perceived value of educational subtitling, investigate student viewing habits in relation to subtitling, and assess the efficiency of plain English and multilingual approaches in facilitating access to and comprehension of educational content. By addressing these gaps, this research seeks to provide valuable insights into the potential benefits and challenges of educational subtitling, offering practical recommendations for its implementation and contributing to enhancing inclusive and effective higher education practices.

A case study approach was selected for this study. For each article in this study, the justification for making use of a case study approach will be set out in the paragraphs that follow. For the

first article, which measured the perceived usefulness of the subtitles, a case study involving students in NAS offered a real-world context to explore the perceived usefulness of academic, plain, and keyword English subtitles. By selecting this specific institution and group of students, detailed feedback and insights were gathered based on students' experiences. This approach allows for in-depth examination and personal narratives, shedding light on the preferences and challenges faced by students within this unique academic setting.

For the second article, which used eye-tracking as an indicator of attention allocation in a selected video from the DAF200 module, a case study provided an opportunity to closely examine the impact of subtitling in this particular educational context. This method allowed for a nuanced analysis, as students' engagement with the content could be observed, as well as which parts of the video drew their attention, and how the use of subtitles influenced their comprehension and language acquisition.

For the third article, which involved the creation of academic and plain English word lists, a case study can involve collaborating with the lecturer of the DAF200 module, to determine which keywords were important for students in each video. A case study enabled the documenting the word list development process, from identifying key terms to testing the lists. This hands-on approach enabled a detailed examination of the practical aspects of creating word lists and tailoring them to the needs of a particular group.

The final article, which focuses on language accessibility in higher education, also benefitted from a case study approach. When exploring how South African universities are using technology for language accessibility, a case study allows for deeper examination into the strategies and challenges faced by educational institutions. By selecting South African universities as case examples, the study investigates their specific approaches to technology implementation, assessing the impact on language accessibility. This approach enabled a comprehensive understanding of the South African higher education landscape and its efforts to enhance accessibility.

- a) In addition, the study had the following objectives: To determine the perceived usefulness of SLS among students in the natural sciences;
- b) To explore attention allocation in eye movement patterns;

- c) To investigate the feasibility of replacing academic vocabulary with plain English in subtitles; and
- d) To provide an overview of the DHET (2020) language policy implementation by South African universities and other technological initiatives to advance multilingualism in higher education.

1.7 Methodology

As the research aims to study certain aspects of educational subtitling in South Africa that have yet to be investigated in depth, a mixed method research methodology has been applied to this study to investigate the perceived value of educational subtitles, students' viewing patterns thereof, plain English subtitles, and multilingual initiatives in higher education. The participants in this study consisted of the 2020/21 cohort of students for UP's DAF200 module. This was done because this module had unsubtitled videos readily available ahead of the COVID-19 pandemic, which these students were already using as part of the course.

It should be noted that this study is, first and foremost, a case study, which aimed to test the impact of SLS, plain English and keyword subtitles on student reception and cognition while evaluating subtitling and other educational technologies and their use in line with the DHET language policy. This design is based on a well-recognised and widely referenced experiment by Perego et. al. (2010:243). Case studies are generally considered adaptable "in terms of drawing from a wide range of sources of data" (Saldanha and O'Brien, 2014:8). A case study approach was favoured for this study as at present, experimental research in audio-visual translation is still relatively recent, and this method could introduce issues into the study such as "... [problems with the] methodological soundness and reliability [of] experimental practices, replication and reproducibility of findings, and even some foundational issues related to the very contribution of experimental research to social sciences research" (Greco, Jankowska & Szarkowska, 2022:1).

There are many advantages to using a case study methodology in subtitling research. Firstly, it enables deep examination of a particular phenomenon and offers insightful information that is rich and grounded in context (Saldanha and O'Brien, 2014:5). Case studies are particularly helpful for analysing actual events where logistical or ethical limitations prevent using experimental or quantitative methods (Saldanha and O'Brien, 2014:28).

Case study techniques can offer an in-depth understanding of the intricate procedures and practices involved in subtitling in a particular context, which is pertinent to subtitling research. The case study approach enabled the researcher to examine the complexity of the subtitling field in the complex context of language access in higher education in a multilingual developing country. With this approach, the difficulties, alternatives, and outcomes of subtitling processes were examined while taking user preferences, readability, accuracy, and cultural adaptability into account. Case study approaches in the present research have offered insightful information that aided in the creation of subtitles, the development of word lists, and the evaluation of subtitling and other technologies related to multilingualism at tertiary institutions.

However, there were also potential drawbacks to using a case study methodology, which had to be considered. Generalisability was a possible concern as case studies focus on specific contexts and may not be representative of broader populations or situations (Saldanha and O'Brien, 2014:36). The findings of a case study are highly dependent on the specific case selected, and there is a risk of researcher bias influencing the interpretation of data. Additionally, case studies often involve a small sample size, limiting the statistical power and generalisability of the findings. This occurred in the second article of this thesis, resulting in Sepedi and isiZulu subtitles to remain unused during this study. Despite these limitations, when used appropriately and in combination with other research methods, case studies provide valuable insights and contribute to the understanding of complex phenomena, with the result that this method proved useful in the present research overall.

1.7.1 Instruments and methods

One of the goals of this study was to investigate student reception, i.e. how students respond to the use of subtitles in discipline-specific studies. Considering student attitudes and perceptions, educational subtitles could be adapted to local student needs for greater effectiveness. This has been addressed using a set of videos from modules in the natural sciences, which were subtitled. Once the videos were viewed, participants were asked to complete a short questionnaire to outline their experience with subtitled and non-subtitled videos and gauge their reception.

This student feedback was helpful concerning the second objective of this research, which is to investigate the cognitive effectiveness of watching subtitled discipline-specific videos. The study aims to establish the difference between the effectiveness of watching non-subtitled

discipline-specific and subtitled discipline-specific videos by using the abovementioned videos from modules in the natural sciences. This method was useful in establishing the cognitive effectiveness of academic English as opposed to plain English discipline-specific videos, as outlined in the research objectives. Cognitive effectiveness (such as memory, cognitive understanding of the video content and information processing) has been investigated using gaze (attention) duration in eye-tracking comprehension in conjunction with scene and word recognition (Perego et al., 2010:262). Eye-tracking was administered using the Tobii X3-120 eye-tracking device.

These videos' subtitles form the basis for the word lists used in the third article of the study. The word lists for this study were created using WordSmith Tools version 5.0 (Lexical Analysis Software Ltd, 2022). Concordance tools such as WordSmith Tools are already linked to established corpora, and this aided in identifying words according to frequency lists: the most frequently occurring 1000 words, then those in the 2000 and 3000 most frequently occurring word lists, as well as in the academic word list, as identified by Coxhead (2000:213). This may help to differentiate plain English from academic English.

Three sets of subtitles were developed for each video: academic register, plain English and keywords. Students were shown how to navigate these subtitles via an instructional video. The viewing statistics of these videos were then assessed to see which subtitles the students favour most in order to gauge their reception of the various types of subtitles.

The academic English subtitles are a transcription of what is said in the videos (while attempting to retain discipline-specific terminology), while the plain English subtitles “translate” the academic English text into commonly accepted simple English terms. The verbatim academic English subtitles follow subtitling guidelines set out by Karamitroglou (1997:1). The plain English subtitles follow guidelines set out by Cutts (2013:xxiv). The keyword subtitles contain only specific important terms selected by the module's lecturer. It is important to note that the participants selected for this study are not demographically representative, as they participated in the study using convenience sampling.

Lecturers in the relevant module (DAF 200) were approached regarding student participation and recruitment for the study. The researcher liaised with the lecturers of the module in order to recruit students to participate in the study voluntarily. No student was unjustly excluded from the research, and students were not in a dependent relationship with the primary researcher as their lecturer only acted as a liaison between the researcher and themselves. The

recruitment process has therefore been entirely neutral, and students were informed that they might decline to participate in the study at any time with no negative repercussions.

In the consent form shared with participants, they were informed about their right to participate in the study anonymously. Students' names were replaced with appropriate participant numbers for this study to ensure their anonymity. In order to ensure that the data remains private and confidential, the only people with access to the participants' data are the primary researcher and her supervisors. Participants were also informed in the consent form that research reports, presentations and journal articles would not contain any information that could identify them.

The final paper in this collection follows a case study methodology to examine specific South African universities and their language policies (UP, NWU, UFS and CPUT). The case study involved selecting these universities as cases and conducting data collection and analysis based on their language policies and implementation. Data was also collected on technologies and initiatives which these universities had put in place to promote language accessibility. Observations of language policy implementation and analysis of relevant documents, such as official language policy documents and university guidelines, were conducted. The data collected was analysed using qualitative research methods (content analysis) to identify key themes, patterns, and insights related to language policies. The case study methodology allows for a detailed exploration of the specific language policies in place, their implementation, challenges faced, and their impact on various stakeholders within the South African university context.

1.7.2 Participants

This study's first goal was to examine into how participants responded to the subtitles in discipline-specific videos. Videos from an animal anatomy lesson in the natural sciences that had been subtitled were used to address this. The participants were students from the Natural and Agricultural Sciences (NAS) faculty at UP. For the first section of this study, students from both the 2020 and 2021 classes in the specific animal anatomy module were approached. The animal anatomy module was chosen as it already had pre-produced videos ready for subtitling, and these videos formed a core part of the students' course, even replacing their practical classes during the COVID-19 lockdown. Students in the NAS faculty find themselves in an academically competitive environment, where educators "...value clearly written and well-organised writing, [but] few see it as their task to induct students into this literacy" (Jackson,

Meyer & Parkinson, 2006:260). Students' academic and literacy competencies are often taken for granted in these competitive fields. However students in the sciences often need support to enhance their reading, writing and retention skills (Fouché, 2009:3) as educators in NAS do not necessarily centre their teaching around reading and writing skills (Jackson, et. al., 2006:260). Selecting participants from this faculty was therefore particularly useful to the study as subtitles can act as a multimodal intervention approach for students in the NAS faculty.

Participants watched an instructional clip describing which subtitle sets were available and how to activate each set before engaging with the subtitled learning content. Participants were briefed on the advantages of using subtitled content. Each video contained the following sets of subtitles, among others: academic register, plain English, and keywords. The preferences of the participants for the different subtitles were then determined by analysing the viewing data of these videos, which appears on pages 54-55.

When asked to indicate their home language, 52,33% of participants stated that their home language was Afrikaans, 33,72% indicated their home language as English, 5,81% specified that their home language was Sepedi, 2,33% listed their home language as Sesotho, 2,33% as Xitsonga, 1,16% as isiXhosa, 1,16% as Setswana and 1,16% listed their home language as "Other". Consequently, the group was fairly irregularly divided in terms of home language. Further demographic information of the participants is discussed in chapter 2.

The eye-tracking portion of the study was conducted among seven participants in the NAS faculty at UP. The participants were again shown a discipline-specific video from one of their animal anatomy modules with subtitles available in English, Afrikaans, isiZulu, and Sepedi. Due to the abovementioned demographics of the class from which participants volunteered, the only English L2 speakers who participated were Afrikaans L1 speakers. Subsequently, the isiZulu and Sepedi subtitles were unfortunately not used during this part of the study.

Before the video began, participants were introduced to the Tobii X3-120 eye-tracking device. The video started once the equipment was calibrated and the participant felt at ease. The English L2 participants switched between Afrikaans and English subtitles while the English L1 participants exclusively watched the video with English subtitles. The video could be watched more than once by participants. Following the viewing of the clip, each participant was given a list of questions regarding the topics covered in the video, the information in the subtitles, and the events depicted in the video. The questions posed to the participants are listed in chapter 3. Answers were provided to the participants in a multiple-choice format.

1.8 Outline of articles included in the study

The following outline presents an overview of the papers written for this PhD by publication. These articles' topics were chosen based on their relevance and contribution to the research topic, aiming to provide a comprehensive body of literature for the study. Each paper uses a case study approach to explore various aspects of educational subtitling, plain English, multilingualism and language policy, including theoretical frameworks, methodologies and findings. By incorporating these articles into the study, an analysis of the research topic can be achieved, drawing upon the insights and contributions of each piece. The compilation of these papers supports the study's objectives to enhance its validity and contribute to the broader academic discourse surrounding subtitling research.

In each paper, the use of a case study approach provides a personalised, context-specific, and in-depth exploration of the respective topics, making the research more relatable and actionable. This methodology allows for the uncovering of practical insights, challenges, and solutions in real-world educational settings. Additionally, the results of case studies can offer valuable recommendations and best practices that can be directly applied to improve the educational experiences of students in NAS.

1.8.1 The justification for a PhD thesis by publication

A thesis by publication was chosen to disseminate the current research for various reasons. Firstly, this method allows the researcher to showcase their work and contributions throughout their doctoral studies, promoting the dissemination of knowledge and making their research accessible to a wider audience, and doing so while the current research is relevant and in keeping with changing audio-visual technologies.

Secondly, this method was used so the researcher could engage in continuous research and publication activities, fostering a sense of productivity and momentum. It also promoted productive collaboration with other researchers in the field.

The contributions of each part of the present study as well as the justification for the chronological presentation of the chapters (articles) are discussed in the following paragraphs.

Considering the contribution of the first article, measuring the perceived usefulness of academic English, plain English, and keyword English educational subtitles, this study provides insights into the effectiveness of the different subtitle types. This contributes to the existing body of research on educational technology, language learning, and pedagogy.

Researchers can use these findings to refine theories of how language accessibility aids comprehension and to develop best practices for designing subtitles to suit various learner needs. It also offers comparative data that can inform subtitle creation across different academic disciplines.

The second article, which investigates the use of subtitling to promote comprehension and language acquisition in subject-specific educational videos, contributes to research on multimedia learning and second language acquisition. The inclusion of eye movement data adds a novel dimension to the study, contributing to the emerging field of educational technology and its impact on cognitive processes. This research can inform instructional design theories and provide evidence of the efficacy of subtitling in enhancing learning outcomes.

The third article's focus on development of academic and plain English word lists for undergraduate students in NAS fills a gap in educational research related to vocabulary acquisition and subject-specific language development (Jackson, et. al., 2006:260). This research can expand existing work on word lists and their effectiveness in enhancing students' language proficiency, especially in specialised fields. It also highlights the importance of tailoring word lists to specific academic contexts, which can be applied to other disciplines.

The final article offers a study on how South African universities are using technology for language accessibility in higher education, and contributes to the broader conversation on educational accessibility, linguistic diversity, and technology integration. This research can hopefully help shape policies and practices in higher education institutions, not only in South Africa but also in other regions with linguistic diversity and accessibility challenges. It adds to the body of knowledge on inclusive education and the role of technology in addressing language barriers.

It should be further noted that the chapters (articles) in this thesis by publication are presented chronologically, i.e. in the order in which each study was conducted. This was done to demonstrate the progress and development of the research, and to maintain a consistent and coherent narrative throughout the thesis. The first article explores the perceived usefulness of different types of subtitles (academic English, plain English, and keyword English) among students in the NAS faculty at UP. It sets the stage by introducing the concept of educational subtitles and their relevance in the context of this specific academic field.

Building on the first article, the second article delves into the study's broader educational context. It discusses how subtitling can promote comprehension and language acquisition, with a focus on subject-specific educational videos. It introduces the concept of using eye movement as an indicator of attention allocation, connecting the use of subtitles to enhanced comprehension and language learning.

The third article bridges the gap between the previous two articles by emphasising the importance of academic vocabulary. It discusses the development of word lists specifically designed for undergraduate students in NAS. The use of academic and plain English word lists aligns with the concept of subtitles, as it enhances students' comprehension of subject-specific content.

The final article broadens the discussion to the accessibility of higher education, connecting the use of technology to the enhancement language accessibility. This article explores how South African universities are employing technology to address language accessibility issues. This broader perspective incorporates the themes of language, technology, and accessibility introduced in the previous articles and underscores their importance in higher education.

By presenting these articles in this sequence, there is a logical progression from the perceived usefulness of different types of educational subtitles to their role in comprehension and language acquisition, the development of specialised word lists to enhance understanding, and finally, the broader context of language and accessibility in higher education, particularly in South African universities. This chronological arrangement illustrates the interconnectedness of these topics and how they contribute to a comprehensive discussion of language and accessibility in the academic context.

It should further be noted that due to the nature of academic articles, the word count for each article is limited in terms of the guidelines set out by the respective journals, and thus sections such as the methodology of each article are shorter than they would traditionally be.

1.8.1.1 Article 1: Perceived usefulness of academic English, plain English and keyword English educational subtitles among students in the Natural and Agricultural Sciences Faculty from an intralingual perspective

This article examines how students in a faculty of natural and agricultural sciences (NAS) respond to subtitles and analyses their responses to such subtitles. By presenting participants with subtitled videos relating to the subject matter of their module, it was investigated how well academic English (near to verbatim transcription), plain English, and keyword English subtitles were received and responded to. After that, participants were invited to complete demographic and affective surveys and focus group interviews to gauge how they reacted to the various subtitles. The findings demonstrate that subtitles in plain English were especially well-received by participants. The participants in the focus groups reported that they found all three sets of subtitles helpful for taking notes, pausing the videos to change how quickly they accessed and processed information, underlining key passages in the study materials, and being able to interact both aurally and visually with the subject matter. This emphasises students' readiness for subtitles as a tool for academic mediation from the standpoint of higher education. The push for multilingualism in higher education has revealed inadequacies in the implementation of language policy by higher education institutions, which are addressed in this article. This imbalance can be addressed by using academic subtitling research as a tool for academic mediation.

Any educational tool or technique's reception and effectiveness are significantly influenced by how valuable people think it to be. To assess the effectiveness of educational subtitling and pinpoint areas for development, it is critical to understand the views of students, instructors, and policymakers. This article attempts to illuminate the stakeholders' attitudes, opinions, and beliefs by examining the perceived advantages, difficulties, and potential drawbacks related to educational subtitling. Such knowledge can influence how classes are taught, policies are made, and technology is developed for educational subtitles. Some key benefits of educational subtitling have been outlined below and are expanded upon in the first article of this collection.

Firstly, subtitles help students who have trouble understanding spoken language to access educational material more efficiently. Students can read the text and fully understand the subject if it is provided in written form in addition to the video (Perego et al., 2016:222).

Secondly, subtitles can be especially helpful for international students or non-native speakers who might have trouble understanding certain accents or unfamiliar words (Díaz-Cintas &

Remael, 2014:194). They can follow along more easily and gain a deeper knowledge of the material by reading the subtitles. Furthermore, institutions can cater to multilingual students or provide courses to a wider audience by translating subtitles into several languages. This feature promotes inclusion and increases educational access (Kruger and Kruger, 2004:113).

Lastly, by supplementing auditory material with visual cues, subtitles assist students in increasing comprehension and retention (Kruger-Roux & Angu, 2020:64). Mixing visual and auditory inputs improves learning outcomes and aids in students' understanding of challenging ideas. In addition, subtitles can give context, explanations, and clarifications, improving students' mastery of a subject.

Ultimately, educational videos with subtitles improve accessibility, comprehension, and adaptability in higher education. They meet various learning demands, encourage inclusion, and aid in efficient learning and memory retention.

1.8.1.2 Article 2: Subtitling to promote comprehension and language acquisition in educational settings: Eye movement as an indicator of attention allocation in subject-specific educational videos

Using gaze duration in eye-tracking as a metric for visual attention and gist comprehension along with scene and word identification, cognitive efficiency is explored in this article (Perego et al., 2010:262). This paper also considers whether academic English subtitles give students sufficient time to view the text and the visuals on-screen. This study uses eye-tracking data from seven student volunteers from UP's NAS faculty. Subtitles in English, Afrikaans, isiZulu, and Sepedi were available to the students. Unfortunately, the isiZulu and Sepedi subtitles were not used during this study because the study participants only selected English and Afrikaans subtitles. This paper concludes that participants preferred English subtitles and remembered several concepts from the videos better when their attention was on the subtitles rather than only the on-screen images.

According to the notion of cognitive load, learners with limited cognitive resources and excessive cognitive load, such as having trouble understanding what is being said in class, can hinder learning (Matthew, 2019:30). By adding more textual support, subtitles can lessen this burden and help students more efficiently use their cognitive resources. However, it should be noted that the present study differs from Matthew's study as cognitive load is not the primary

focus of the present study. This article focuses on eye movements to investigate comprehension, recall, attention allocation and language acquisition via instructional subtitling. Eye movements are investigated as a stand-in for attention allocation in subject-specific instructional videos. Another focus of this article is how subtitles can enhance information processing and learning outcomes by combining images and text (Kruger-Roux & Angu, 2020:64).

As it offers insightful information on how viewers interact with subtitles and where their attention is focused while watching subtitled content, eye-tracking is a crucial technique for assessing the effectiveness of subtitles (Liao, Yu, Reichle & Kruger, 2021:1). This article focuses on aspects such as attention allocation, reading patterns, and visual interference through tracking the eye-movements of students as they watch subtitled educational videos.

1.8.1.3 Article 3: Academic and plain English word lists: The development of parallel word lists for undergraduate students in the natural and agricultural sciences

In educational subtitling, the appropriate selection of register – which refers to changes in language use across different contexts – is essential. Effective subtitling must balance adherence to the original content and adaptation to meet the language and cultural requirements of the target audience. Considerations for register include formality, idioms, slang, and cultural specifics. In the third article of this collection, word lists based on two different subtitle types (academic English and plain English) were generated and assessed. This article examines how subject-specific phrases are organised and used in context by creating word lists based on subtitles using a corpus-based approach (Kennedy, 1998:70). The key finding of the third article is that, especially when combined with plain English and subtitling rules, plain English subtitles and an accompanying word list clarify scientific and technical jargon (Cutts, 2020:xxiv; Karamitroglou, 1997:1). However, this study demonstrates that when plain English subtitles do not follow particular conventions, adjustments should be made. Subtitles written in plain English and generally adhering to subtitling norms are more understandable than language containing complex terminology and jargon.

The academic subtitles used in this study were classified as “academic” because they generally contained subject-specific phrases, typically Latin and Greek, which can frequently be unclear to L2 speakers. When studying the subject-specific vocabulary of specialised fields, students can benefit from creating a parallel word list in plain English.

1.8.1.4 Article 4: Language and accessibility: How South African universities are using technology for language accessibility in higher education

The need for multilingual subtitling solutions is growing in multicultural and multilingual societies and globalised educational settings. To meet this requirement, several initiatives have been launched. The initiatives for multilingual educational subtitling will be described in the fourth article of this collection, and their efficacy will be assessed in terms of correctness, timeliness, cultural sensitivity, and alignment with requirements set out by the language policy framework of the DHET (2020:17).

This article acts as a document review, and will analyse how South African institutions promote language accessibility in higher education by utilising technology and their respective policies, as per the DHET's new language policy. Most South African universities struggle with building an inclusive and accessible learning atmosphere (DHET, 2020:14). Universities in South Africa have therefore implemented language policies that reflect a more comprehensive knowledge of the advantages of inclusivity as higher education has evolved over time (Drummond, 2016:74). The relationship between linguistic restrictions and technological improvements that increase accessibility and multilingualism in higher education is examined in the fourth article of this collection.

The article underlines the efforts of selected South African universities to promote multilingualism by starting with a discussion on language accessibility in higher education and the relationship between these universities' language policies and the technological advancements they have employed to foster a multilingual environment. The article also investigates how technological advances in higher education linked to language accessibility connect to internal language policies (Letsoalo, Mabaso & Gouws, 2022:1). The discussion of the advantages and potential drawbacks of these developments in language accessibility concludes the article.

1.9 Conclusion

Educational subtitling has emerged as a powerful tool for improving accessibility, inclusivity, and learning outcomes in educational settings. By examining the perceived value, cognitive implications, register considerations, and multilingual initiatives related to educational

subtitling, this study aims to provide valuable insights and contribute to the growing body of knowledge in this field. The results of this study can assist educators, decision-makers, and other stakeholders in improving the educational experience for diverse learners by integrating and putting educational subtitling into practice.

Chapter 2: Perceived usefulness of academic English, plain English and keyword English educational subtitles among students in the Natural and Agricultural Sciences Faculty from an intralingual perspective

Abstract

The study is an analysis of the reaction of students to subtitles and also includes an investigation of their responses thereto in a faculty of natural and agricultural sciences (NAS). Reception of and responses to academic English (close to verbatim transcription), plain English and keyword English subtitles were explored by showing participants subtitled videos related to the content of their module. Participants were then asked to complete demographic and affective questionnaires and participated in focus group interviews to investigate their reception of the various subtitles. The results show that participants responded particularly well to plain English subtitles. The focus group interviews indicated that they found all three sets of subtitles useful for note-taking purposes, adjusting the speed at which they accessed and processed information by pausing the videos, highlighting important information in the study materials, and being able to engage aurally and visually with the materials. From a higher education perspective, this emphasises students' readiness for subtitles as an academic mediation tool. This article aims to fill existing gaps in the fulfilment of higher education institutions' language policies, which have been exposed by the thrust for multilingualism in higher education. Research into academic subtitling as an academic mediation tool can be used to bridge this gap, thereby supporting innovative research in higher education.

Keywords: subtitles, plain English, inclusivity, reception, video learning, accessibility, higher education, academic mediation

2.1 Introduction

As digital media becomes increasingly prevalent and widespread in leisure and education settings, concerns regarding the issue of language accessibility in various digital mediums have been highlighted. A common mode of improving accessibility of digital media is the use of subtitles. Interlingual and intralingual subtitles are the most common subtitling forms used in digital media. Interlingual subtitles refer to translated subtitles not in the same language as the spoken text in a video. In contrast, intralingual subtitles are “a written rendition of spoken dialogues in the same language, for instance, the English subtitles of an English language programme” (Szarkowska, Díaz-Cintas & Gerber-Morón, 2020:661).

In a study on subtitle reception among NAS students at the University of Pretoria several videos in the students’ animal anatomy course included subtitles in the original (academic) English, plain English and keyword subtitles. It is important to note that this group cannot be regarded as either demographically or academically representative of the student body. They were chosen based on the availability of existing discipline-specific video material in the specific course. These students formed part of the 2020/21 cohort of NAS second-year students.

The subtitles used in this study were generally intralingual. This article explores students’ reception of all English subtitles used in this study by considering access patterns, questionnaire responses and focus groups. The article does not focus on the subtitles’ impact on comprehension of the material, as this was already the focus of a multivariate analysis conducted by Kruger-Roux and Angu at UP’s faculty of medicine (2020:63). The study has a qualitative and quantitative focus on reception, which was not a focal point of Kruger-Roux and Angu’s study. Google Analytics from the videos and the accompanying statistics are used to analyse the participants’ access to the various subtitles. Participants’ affective responses to the subtitles are investigated by analysing responses to a questionnaire on the usefulness of the subtitles and participation in focus group interviews.

At the start of the 2020 academic year, it was planned to use the subtitled videos on animal anatomy as additional material to the existing practical component of the module. However, in March 2020, South Africa was placed under national lockdown due to the COVID-19 pandemic (South African Government, 2020:n.p.). This meant that academic activities that would normally occur on university campuses were subsequently suspended, and the subtitled videos used in this study were used as replacements for students’ practical sessions instead of being merely a supplementary component. The subtitled videos, therefore, replaced the

students' in-person practical sessions altogether, meaning that the videos and subtitles became an integral part of the module which formed the focus of this study.

Research into the usefulness of academic English, plain English, and keyword English educational subtitles is a novel contribution that has the potential to promote discourses about transformation in higher education. Researchers can gain knowledge about the best methods for bridging language barriers in academia by examining how various kinds of subtitles improve language accessibility and comprehension. Academic English subtitles can help students improve their language abilities and make it easier to participate in academic discourse (Lacroix, 2012:148). Conversely, plain English subtitles can improve accessibility for students with diverse levels of language competency by simplifying technical terms and principles. Knowledge retention and retrieval can be facilitated by keyword English subtitles, which draw attention to important terms and ideas. Understanding the effects and advantages of these various subtitle types can allow higher education institutions establish inclusive teaching methods, curricula, and language policies. Ultimately, by addressing linguistic obstacles and fostering fair access to knowledge and opportunities, this research adds to ongoing discussions and efforts around transformation in higher education.

2.2 Literature review

Initially, the driving force behind the promotion of multilingualism in education and government settings, was an interpretation of Section 6 of the Constitution of the Republic of South Africa. (1996:4), which states that all official languages should be treated equally, as opposed to the privileged status previously held by English and Afrikaans (Olivier, 2011:228). This may have been the catalyst for certain initiatives related to multilingualism in education. However, 15 years into the new democratic dispensation, previously dual-medium or Afrikaans universities started adopting English as their medium of instruction, leading to a demand for additional academic assistance in languages other than English from the classroom up to tertiary education level (Antia, 2015:576; Benson, 2018:218; Hungwe, 2019:2; McNamee & Rule, 2019:166). In 2016, the Department of Higher Education and Training (DHET) released a new draft language policy (promulgated in 2020) in which it stressed the responsibility of universities to be language-inclusive, as well as the fact that not much had been done in this regard over the past 20 years (DHET, 2020). Therefore, plain English and keyword subtitles are strategies that may mediate barriers to language inclusivity in higher education.

Various studies have underlined the advantages of subtitled content in educational settings. Some of these advantages include the improvement of “academic literacy levels...[and] processing of information, [as well as students’] receptive abilities” (Lacroix, 2012:50). However, as Lacroix (2012:50) rightly points out, the benefits of same-language subtitles (SLS) cannot be examined before examining why such mediations are necessary. The University of Pretoria’s Language Policy (effective from 1 January 2022), specifically section 4.3, acknowledges that students require academic mediation regarding language and related barriers in academic contexts (University of Pretoria, 2016). Academic content with SLS and plain English subtitling could be regarded as mediation. Part of the reason for the necessity of these mediations are low levels of English proficiency among South Africans.

According to Cummins (2001:67), language proficiency “refers to the extent to which an individual has access to and command[s] the oral and written academic registers of schooling”. Low levels of English proficiency among South Africans begin in the education system’s foundation phase, where learners often do not have access to the academic language they are instructed in at school, which means that they struggle to use academic language later on in their education. These low language proficiency levels (in English and other languages) then carry over into the secondary and tertiary education phases, as “the typical practice in South African schools is to use the mother tongue through Grade 3 and then switch to English” (UNICEF, 2016). This means that learners who do not have English as their home language experience confusion as they must adjust to the use of English after the foundation phase, while “ironically, English and Afrikaans speakers continue to benefit from mother-tongue medium education as they did during the colonial and apartheid eras” (Heugh, 2011:153).

Another contributory factor to these low language proficiency levels is “the fact that the school-leaving examination [in South Africa] assesses the mastery of the school curriculum rather than readiness for the linguistic demands of university studies” (Van Rooy & Coetzee-Van Rooy, 2015:33). Therefore, this language proficiency (or lack thereof) can negatively impact tertiary academic performance if not addressed through mediation methods (Lacroix, 2012:43). If the Language Policy Framework for Public Higher Education Institutions (2020:17) and the University of Pretoria’s language policy are to be adhered to, and language proficiency issues are addressed, a mediation method such as academic content with SLS and plain English subtitling potentially benefits students. This is especially true in cases where students also need to adjust to the differences between everyday spoken English and academic English in tertiary settings.

It is clear that, while historically some incorrect assumptions may have been made about the place of subtitling in multilingual education (such as that it would fill a void created by the constitutional obligation to promote multilingualism) (Hlatshwayo & Siziba, 2013:84), educational subtitling does have a role to play in practical terms to enhance retention and language acquisition for academic success.

Considering the factors that may necessitate mediations, such as subtitled academic material, the benefits of such mediation should be explored. The benefits of subtitled materials include; improved subject matter recollection, vocabulary expansion and improved communication capacity (Danan, 2004:71). However, Danan warns that, despite these benefits, educators should be vigilant and not ignore limitations. These may include “visual input which is too far beyond the linguistic competency of the viewers [which] may yield poor language gains” (2004:71). This is an important factor that presented a serious potential limitation to the present study, hence the use of plain English and keyword subtitles in addition to the verbatim academic English subtitles were investigated. The meaning of ‘verbatim’, in the context of this study, does not include natural-speech phenomena such as interruptions, incomplete sentences and hesitation markers. It refers to full text of the content, as close as possible to the original phrasing with a somewhat simplified syntax, yet without reproducing syntactical errors, and within the constraints of the 70-character subtitle limit.

To further determine the effectiveness of subtitles and their reception, this study reviewed research by Perego, Laskowska, Matamala, Remael, Robert, Szarkowska, Vilaró and Bottiroli (2016:219) in which one of the goals was to determine whether watching subtitled material was “more challenging and less enjoyable for viewers who are not habitual users of subtitles” and “whether subtitling offers greater benefits to those who are familiar with it” (2016:219). This study found that viewing subtitled material was “cognitively effective” and that viewers who engaged with the subtitled material showed good results when asked to demonstrate word-related skills after viewing the subtitled material (Perego et al., 2016:220). Perego defines cognitive effectivity as the ability to understand content (Perego et al., 2016:206). These results further demonstrate the benefits of subtitled material, and in an educational setting, Perego et al. recommend further research to determine whether these positive effects can be replicated in other specific target users (2016:220). The current study aims to determine whether educational subtitles proved beneficial to students in a specific module in the University of Pretoria’s NAS faculty, focussing on specific target users to build on the research conducted by Perego et al. (2016:220).

In terms of subtitle reception, Gambier (2018:55) raises the important issue of accessibility. Gambier highlights certain features of accessibility (which, in turn, influence viewer reception) that should be considered in both SLS and translated subtitles. These features include adherence to acceptable language criteria, legibility (concerning font choice, screen positioning and subtitle speed), readability (cognitive load), synchronism and the relevance of the information displayed on the screen (Gambier, 2018:55). Gambier further focuses on the “three R’s” of reception, namely response, reaction and repercussion (2018:57).

In terms of response, Gambier notes that much attention is generally given to questions of how “attention [is] distributed between images and subtitles”, whether subtitles are read one word at a time, whether audiences would rather avoid reading the subtitles on-screen, and whether they read a subtitled line more than once (2018:57). Relating to reaction, Gambier asks whether the audience must assume any “shared knowledge to allow efficient communication” and which possible interferences could occur while engaging with subtitled materials (2018:57). Lastly, Gambier (2018:57) defines the concept of repercussion both in terms of viewers’ preferences and attitudes and the socio-cultural context of the viewers. These are all important aspects that were considered and discussed in the present study.

Finally, the results of a study conducted by Kruger-Roux and Angu found that subtitled learning materials are an effective educational tool for students’ understanding “of complex scientific terms because they assisted in improving participants’ ability to identify and acquaint themselves with keywords used in the video” (2020:70). The study also found that subtitled learning materials allow students to “make use of implicit and explicit memory” because “subtitles [assist participants] with both visual and auditory recognition” as a form of “implicit and explicit” memory (Kruger-Roux & Angu, 2020:71). Participants’ reception of and responses to the subtitled materials in this study were generally positive, with the results and responses from participants suggesting that “subtitles can enhance student comprehension of video content, retrieval and retention of information and vocabulary building, as well as developing critical reading and listening skills” (Kruger-Roux & Angu, 2020:70). However, in a country like South Africa, where subtitles are not commonplace, viewers need to be prepared for subtitled materials by being shown explicit viewing strategies, as proposed by Danan (2004:74-75), albeit in a different setting. Kruger-Roux & Angu (2020:70) also recommend in-depth preparation of local student audiences to view and understand subtitled materials successfully. This finding prompted the present study and its approaches to student reception of subtitles, as mentioned in the introduction of this paper.

Based on the literature discussed above, it is clear that there are many benefits related to presenting academic materials with subtitles, including enhanced communication, expansion of vocabulary and accessibility, memorisation and recall skills, and information retention (Kruger-Roux & Angu 2020:71).

2.3 Methodology

The present study used a mixed-method research methodology within a case study design to investigate the reception of subtitled, discipline-specific videos. Participants' cognition was tested through post-video questionnaires and retention tests. This means that both qualitative and quantitative data were gathered and analysed throughout the study.

The first objective of this study was to investigate student reception, i.e. how participants received the subtitles in discipline-specific videos. By considering participant attitudes and perceptions, educational subtitles and the introduction thereof could be adapted to local student needs for greater effectiveness. This was addressed using a set of videos that had been subtitled from a module in the natural sciences relating to animal anatomy. Before viewing the subtitled learning material, participants were shown an instructional video explaining which subtitle sets were available and how to activate each set. They were also briefly informed of the benefits of using subtitled material. This was done to facilitate the viewing strategies and preparation for subtitled materials, as suggested by Danan (2004:74) and Kruger-Roux and Angu (2020:70). Each video included (among other home languages) the following sets of subtitles: academic register, plain English and keywords. The viewing statistics of these videos were then assessed to see which subtitles the participants favoured to investigate their reception of the various types of subtitles. The subtitles were distinguished as follows:

- The academic English subtitles consisted of close to verbatim transcriptions of what was said in the videos while retaining discipline-specific terminology. In contrast, plain English subtitles “translated” the academic English text into everyday English terms. The verbatim academic English subtitles followed the subtitling guidelines set out by Karamitroglou (1997:1). These guidelines include syntactical simplifications, such as

preferring the passive voice to the active voice, positive expressions for negative expressions, and the like.

- The plain English subtitles followed guidelines as set out by Cutts (2020:xxvi-xxxvii) and Blamires (2000:9-12). These guidelines overlap somewhat with Karamitroglou (1997:1), although they are more exhaustive and lexically prescriptive.
- The keyword subtitles contained only certain important terms the module's lecturer selected.

Once the videos were viewed, participants were asked to complete a demographic and affective questionnaire to outline their experience of the subtitled videos, indicating the perceived utility of the different types of subtitles.

Results were collected through post-video questionnaires as well as a post-video comprehension test. The following research questions were considered:

1. What is the students' reception of the various subtitle options that have been made available, and what do their usage statistics show about the subtitles they prefer most?
2. How does student subtitle reception impact the decisions in educational subtitling, and how do they shape the conventions of educational subtitling?
3. What effect does the register of these various subtitles have on the students' reception, academic performance and general literacy? How can these effects be measured?

2.4 Results

Below, the participants' demographic information and viewership habits are discussed. In addition, the results of the questionnaires and focus group discussions based on participants' reception of the subtitled videos are also discussed.

2.4.1 Participant demographics

Due to South African university students' varied socio-cultural environments and the variety of official languages spoken in South Africa, the study had to identify possible extraneous variables. A set of possible extraneous variables was included in the questionnaires given to participants, as outlined in the section below. Among others, extraneous variables were used to compare the representativity of the participants to the university community as a whole.

According to the self-disclosed information taken from the questionnaire, 90,7% of the participants indicated that they were between 19 and 22 years old. In comparison, 8,14% indicated that they were older than 23 years, and only 1,16% indicated that they were younger than 18. This means that most of the participants fall within the same peer group.

Furthermore, when asked to specify their home language, 52,33% of participants stated that their home language was Afrikaans, 33,72% indicated their home language as English, 5,81% said that their home language was Sepedi, 2,33% listed their home language as Sesotho, 2,33% as Xitsonga, 1,16% as isiXhosa, 1,16% as Setswana and 1,16% listed their home language as "Other". Therefore, the group of participants was rather unevenly distributed in terms of their home language, as shown in Figure 1 below.

When compared to the latest available home language data at the University of Pretoria (2014:5) as well as the participants in the study by Kruger-Roux and Angu (2020:71) at the University of Pretoria's Faculty of Health Sciences, it is also clear that the participants in the present study are not representative of the University as a whole in terms of their spoken home languages, as shown in Figure 1 below. Therefore, future studies could be done on more representative samples since the online pivot of educational materials due to COVID-19 is likely to have led to the creation of more discipline-specific visual material.

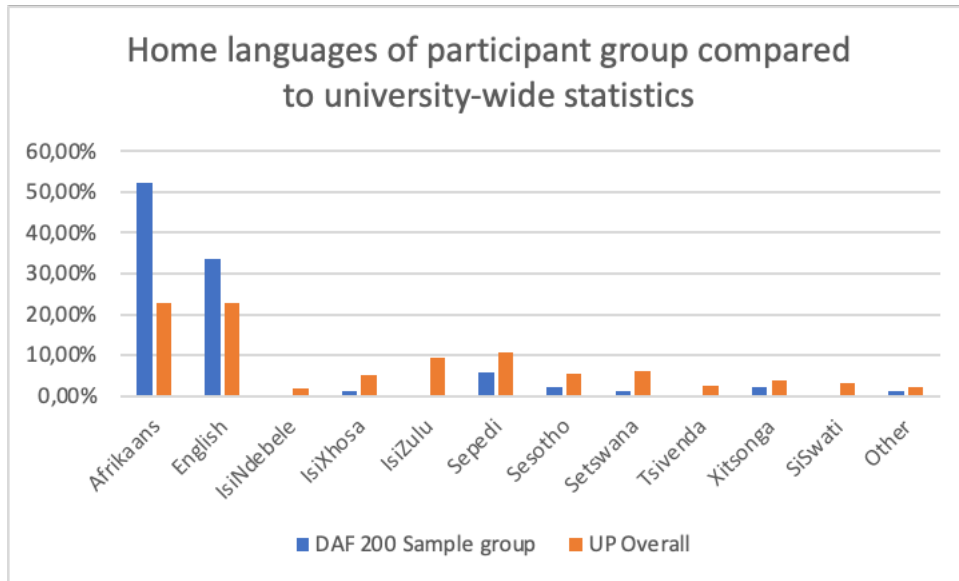


Figure 1: Chart showing participants’ home language for the current study compared to the indicated home language of registered students at the University of Pretoria (2014:n.p.)

When asked how English as a subject was presented to them during grade 12, 44,19% of participants indicated that English was taught at their school as a home language (HL). In contrast, 55,81% said that English was taught as a first additional language (FAL). In terms of the participants’ school performance in English, 34,88% of participants indicated that they received a code 7 (80-100% or A) result for English in grade 12, while 51,16% received a code 6 (70-79% or B), and 13,95% received a code 5 (60-69% or C) (Umalusi, 2013:n.p.). None of the participants received lower than a code 5. However, these results should be viewed with the added context that “the additional language curriculum in the National Senior Certificate pays lip service to abstract cognitive academic language skills [and that] too little emphasis is placed on cognitive academic language proficiency in the communicative approach to language teaching in schools, resulting in students arriving at university with poor writing skills” (Van Rooy & Coetzee-Van Rooy, 2015:32). The participants therefore received relatively high marks for English at school, which may have influenced the high self-evaluation of their English reading skills.

When asked to self-evaluate their English reading skills, 39,53% of the participants rated their skills as excellent, 59,30% rated their skills as good enough and only 1,16% of participants

indicated that they thought their skills were poor. Therefore, 98,83% of the respondents thought that their reading skills were sufficient for second-year university studies.

Van Rooy and Coetzee-Van Rooy (2015:32) attribute students' high self-evaluations in terms of their English skills partially to the fact that, because it is not a focal point at school, the students do not necessarily know that their academic literacy capabilities are lacking. Van Dyk, Van de Poel and Van der Slik point out that first-year students' high estimates of their own reading skills only become "more realistic" after they have received results from their first assessments, and only then are they "critical about their abilities and more willing to change and adapt their learning strategies and accommodate to the academic community" (2013:356). Mediations such as educational subtitling can therefore be especially helpful in bridging such overlooked knowledge gaps.

2.4.2 Affective questions and responses

To gauge the participants' reception to and experiences of the subtitled videos they watched, the questionnaire contained items rating their affective responses to the subtitles on a five-point Likert scale. The options on the scale ranged from strongly agree to strongly disagree. Participants were then divided into small focus groups on Zoom, where they could discuss how they felt about using subtitled videos. Participants' responses to the academic English, plain English and keyword subtitles were tested separately. Participants' overall reactions to the subtitles were considered first, and then their responses to the different subtitling options were reviewed.

In a series of statements on the questionnaire, participants were asked about the comprehensibility of the academic English subtitles. In response to these statements, participants' feedback was as follows:

Table 1: Participants' responses to statements about the readability of the academic English subtitles

Questionnaire statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I understand the contents better in the video with subtitles.	52,94%	35,29%	5,88%	3,53%	2,35%
When the voice is unclear, the subtitles help me to understand.	58,82%	31,76%	2,35%	4,71%	2,35%
When the voice is too fast, the subtitles help me to understand.	55,29%	34,12%	5,88%	3,53%	1,18%
Having words and pictures together helps me understand.	65,48%	27,38%	5,95%	1,19%	0,00%
I learn better when I see and hear at the same time.	64,29%	29,76%	4,76%	1,19%	0,00%
Academic English subtitles show me how to write at university.	44,71%	28,24%	18,82%	3,53%	4,71%

Participants were also presented with a statement about the readability of the plain English subtitles. There was a generally positive experience among participants of the plain English subtitles as an educational mediation, and most participants found the plain English subtitles to be a helpful learning aid, as shown in Figure 2 below:

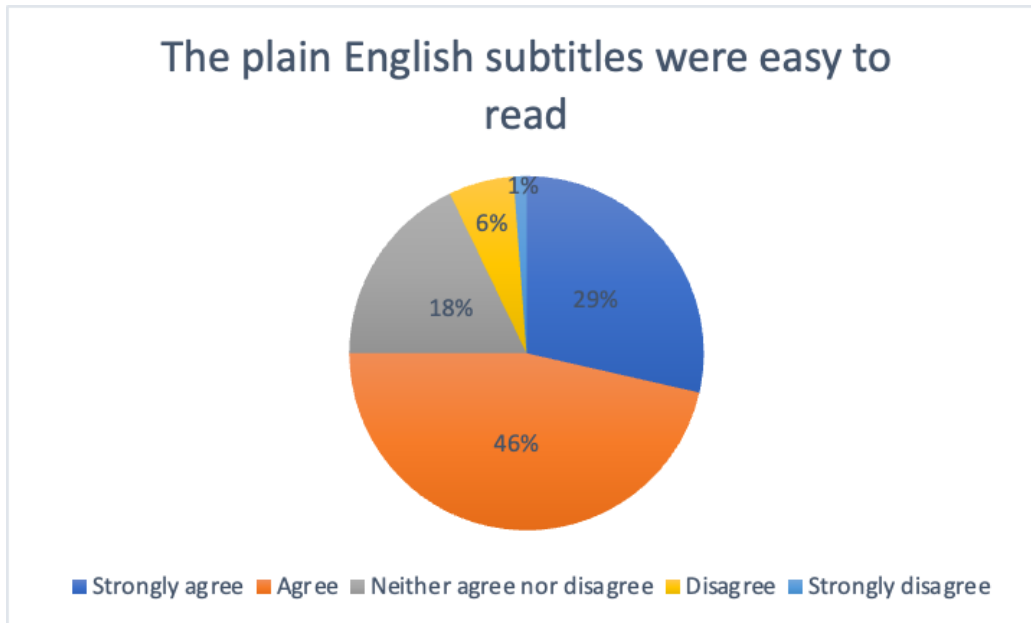


Figure 2: Chart showing participants' response to whether they found the plain English subtitles easily readable

Another important aspect of rating the participants' reception was determining whether any aspects of the subtitles hampered their learning and viewing experiences. The Likert scale section of the questionnaire included statements designed to test certain propositions that would help to ascertain this. The participants echoed the responses illustrated in Table 2 below during the focus group session, stating that they did not feel that the subtitles obstructed important images on the screen:

Table 2: Participants' responses to statements about the subtitles' possible intrusion on their learning and viewing experience

Questionnaire statement	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Subtitles make it difficult for me to focus on the image.	5,88%	12,94%	28,24%	38,82%	14,12%
The subtitles distract me.	0,00%	7,06%	18,82%	40,00%	34,12%
The subtitles hide an important part of the screen.	1,18%	2,35%	10,59%	42,35%	43,53%

2.4.3 Focus group responses

In terms of the subtitle options (verbatim, plain English and keywords), the participants responded fairly positively to the verbatim academic English subtitles in their focus groups, with one of the participants (Participant 11) noting that “in videos where we had the anatomy [terms] explained to us, it helped to have the subtitles there so that we could pause and look at how they spelt it and it helped in the long run as well because we could both read and listen to what they were saying”.

Some participants also found the verbatim academic English subtitles to improve the module’s level of accessibility, with one participant (Participant 10) stating in the focus group, “I have a lot of problems hearing lecturers, especially if I can’t see them, so I can’t read their lips...so having the subtitles was amazing”. In the videos presented to the participants, the visual is mostly of the dissection, and the speaker is visible only for very short periods. As a result, the added subtitles are a characteristic of good discipline-specific videos where the audio and visual channels are used to maximise working memory (Barne, 2015:n.p.).

Although the keyword subtitles were not as widely used (see Figure 3 below), they were still received relatively positively by participants, with one participant (Participant 6) in the focus group specifically saying: “after taking notes down, I would watch specifically with the [keywords]... [it helped] to highlight specifically the keywords that were important for that section within the video”. Other participants in the focus group agreed that this aided in their note-taking while watching the videos.

This indicates that, in general, the participants responded positively to subtitled material in their module’s videos, with 57,65% of the participants strongly agreeing that subtitles should be used in all university videos and 32,94% agreeing. In the focus group discussions, agreement with the statement that subtitles should be used in all university videos was further verified, with one of the participants (Participant 8) noting, “I like the fact that I can hear what they’re saying and see what they’re saying at the same time”, and that the subtitles assisted them in paying better attention to the study material. The questions from the questionnaire are sampled in Tables 1 and 2.

2.4.4 Actual access to and use of subtitles

To determine the participants' actual access to the subtitled videos (in addition to videos they watched as part of the questionnaire), Google analytics statistics were retrieved and analysed. In total, 12 videos were made for the module, and these were subsequently subtitled with verbatim academic English, plain English and keyword subtitles. Participants accessed most of the videos independently, although they were only required to specifically access Video 5 and Video 6 for the study. Figure 3 (below) shows the spike in subtitle access after the participants were required to watch Video 5 and Video 6. Figure 3 represents data gathered from YouTube viewing statistics and Google analytics.

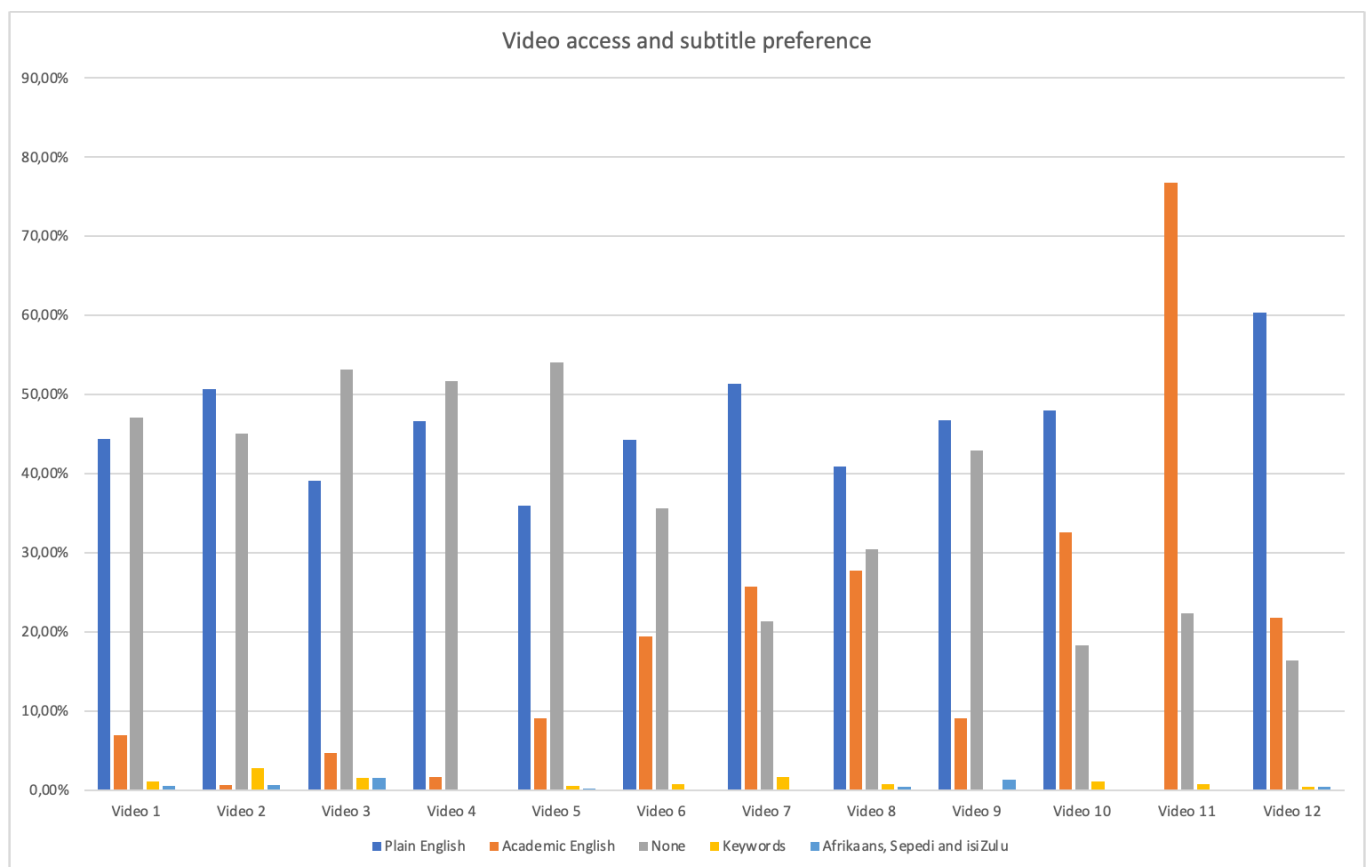


Figure 3: Graph showing video access by percentage of participants and subtitle preference (Note: no statistics on plain English subtitles are available for Video 11, as the video was not subtitled in plain English due to its length).

It is clear from Figure 3 that participants largely watched the videos without subtitles even before they were required to view Video 5 and Video 6 for the study. However, interestingly, the participants consistently seem to have preferred the plain English subtitles above the verbatim academic English subtitles, with the plain English subtitles use even surpassing the

use of the academic subtitles and no subtitles at all for Video 6 and Video 7. This is consistent with the participants' affective responses to the subtitle questionnaire, as most participants strongly agreed that the subtitles in plain English were easy to read, as discussed in the qualitative results above. The popularity of the plain English subtitles could possibly be ascribed to the uneven distribution of the participants' home languages, as set out in Figure 1. It can also be attributed to the English medium of instruction at the University of Pretoria and, therefore, the language in which students are assessed.

2.5 Discussion and conclusion

The data analysis from this study affirms the various benefits of subtitling, and specifically, it shows that students are very receptive to the use of subtitles when adequately prepared for it. From these results, it is clear that using subtitled learning materials in a tertiary education context is received well by participants. The subtitles are generally perceived to impact the participants' learning experiences positively, based on the responses of the students (Perego, 2016:220). Specifically, plain English subtitles (in a scientific context, in the case of the present study), were received especially well and can be refined based on participant feedback. The subtitles are generally not a distraction from the educational materials and are, in fact, a helpful mediation in terms of aiding in participants' note-taking, increasing the speed at which they can access and process information through pausing the videos, highlighting important information in the study materials, and engaging both aurally and visually with the learning materials.

Research into academic subtitling as an academic mediation tool has the potential to bridge the gap in the fulfilment of South African higher education institutions' language policies and support innovative research in higher education. Universities can address the South African language diversity issue and advance inclusivity in education by offering multilingual subtitles (Lacroix, 2012: 25, 35). With the use of this strategy, students who may not be fluent in the language of instruction can access and understand academic material (Hlatshwayo & Siziba, 2013:90). Additionally, academic subtitling can promote new research and develop a diverse academic community by facilitating collaboration and knowledge sharing between academics with various linguistic backgrounds.

The present study has substantiated that subtitled learning materials are a positive asset to tertiary education. Almost none of the participants found the subtitles to be a distraction or

hindrance to their learning experiences, and they made good use of specifically the plain English subtitles when motivated to do so. Having a broader and more diverse understanding of viewers' receptions of and responses to subtitled educational materials is useful in determining whether subtitling can be adopted as an academic mediation in other tertiary education contexts.

Chapter 3: Subtitling to promote comprehension and language acquisition in educational settings: Eye movements as an indicator of attention allocation in subject-specific educational videos

Abstract

This paper focuses on the cognitive effectiveness of watching subtitled discipline-specific videos to determine how subtitling, as an emerging technology, encourages language equity, social justice, and the rise of technomultilingualism. Cognitive effectiveness is investigated using gaze duration in eye movement as an indicator for attention allocation and gist comprehension together with scene and word recognition. Additionally, it considers whether academic English subtitles permit students enough time to look at both on-screen images and text. This study uses eye-tracking data from seven student participants in the Faculty of Natural and Agricultural Sciences at the University of Pretoria. The students were offered subtitles in English, Afrikaans, isiZulu, and Sepedi. However, the participants who volunteered for the study selected largely English and Afrikaans subtitles, and the isiZulu and Sepedi subtitles were unfortunately not utilised during this particular study. This paper concludes that, based on the eye movements of the participants, they preferred English subtitles and remembered certain concepts from the videos better when their focus was on the subtitles themselves rather than exclusively on the on-screen image.

Keywords: cognitive effectiveness; eye-tracking; gaze duration; multilingualism; subtitles

3.1 Introduction

Eye-tracking technology has been increasingly utilised in second language acquisition research, providing insight into how students process written texts and speech in real-time (Conklin & Pellicer-Sánchez, 2016:453). One of the areas where eye-tracking has been used extensively is in the investigation of the impact of subtitles on language learning. Subtitles are commonly used in language teaching and learning as they provide a visual aid that can enhance comprehension, especially for students with limited proficiency in the target language (Kruger-Roux & Angu, 2020:64). However, there has been debate about the effectiveness of subtitles as a language-learning tool, and eye-tracking studies have helped shed light on this issue.

This article reviews and analyses existing literature on subtitle eye-tracking and its role in language acquisition, comprehension, and cognitive effectiveness to contextualise an eye-tracking study using data gathered from seven students in the Faculty of Natural and Agricultural Sciences at the University of Pretoria. The students were offered subtitles in English, Afrikaans, isiZulu, and Sepedi. It should be noted, however, that the participants who volunteered for this study only made use of the English and Afrikaans subtitles, and the isiZulu and Sepedi subtitles were unfortunately not used during this study. This study describes some of the effects of subtitles on language learning, focusing on the factors that influence the efficacy of subtitles, such as text type, language proficiency, and cognitive effectiveness. The study focuses on the cognitive effectiveness of watching subtitled, discipline-specific videos to determine how subtitling, as an emerging technology, encourages language equity, social justice, and the rise of technomultilingualism (Ndlangamandla, 2022:449).

Technomultilingualism is a term which emphasises the link between literacy and technology (Ndlangamandla, 2022:449). Technomultilingualism refers to the ability of technology, particularly digital systems and software, to support and facilitate communication and interaction across multiple languages. It encompasses the use of technology to bridge language barriers and enable multilingual capabilities in various contexts (Ndlangamandla, 2022:449). This could involve, for instance, the development and use of software, applications, and user interfaces that can operate in multiple languages, machine translation, and localisation. Analysing students' eye movements when engaging with academic subtitles could expand on this notion, considering the turn to online or hybrid education by many higher education institutions during the COVID-19 pandemic.

Cognitive effectiveness is investigated using gaze duration in eye-tracking as an indicator for attention allocation and gist comprehension together with scene and word recognition (Perego et al., 2010:243). Additionally, this article considers whether academic English subtitles permit students enough time to look at both on-screen images and text. Finally, the implications of subtitle eye-tracking research for language teaching and learning will be discussed.

Eye-tracking technology involves using specialised equipment to measure the movements of the eyes as a person reads or views a visual stimulus. By recording the duration and location of fixations, researchers can gain insight into the cognitive processes involved in language comprehension. Eye-tracking can provide information on how readers allocate their attention to different parts of a (visual) text, how long they spend on each part, and how they simultaneously process visual and textual information (Conklin & Pellicer-Sánchez, 2016:453).

Subtitle eye-tracking studies have focused on investigating the effects of subtitles on language learning (Liao, Yu, Reichle & Kruger 2021:417). Subtitles have been found to improve comprehension of foreign-language films or TV programmes, as they provide students with visual cues to help them understand the meaning of unfamiliar words or phrases (Birulés-Muntané & Soto-Faraco, 2016:2). However, the effectiveness of subtitles depends on various factors, such as the text's complexity, the learner's proficiency, and the cognitive load imposed by the text and visual stimuli (Kruger & Doherty, 2016:19). Eye-tracking studies have provided valuable insights into these factors and how they affect the processing of subtitles.

Subtitle eye-tracking research has provided valuable insights into the cognitive processes involved in language acquisition and the effectiveness of subtitles as a language learning tool. By examining the factors that influence the processing of subtitles, researchers can help improve the design of language teaching materials and enhance language learning outcomes. Integrating eye-tracking technology into language acquisition research has opened up new avenues for investigating language learning processes.

3.2 Background

Eye-tracking, subtitling, and multilingualism are three research areas that have garnered increasing attention in recent years. The use of subtitles has become ubiquitous in global film and television industries to reach wider audiences. However, reading subtitles can be complex

for multilingual audiences, requiring significant cognitive effort and impacting viewer attention and comprehension. Eye-tracking technology has emerged as a promising tool for understanding the cognitive processes involved in subtitle reading and has been used in several studies to investigate the effects of subtitling on multilingualism. This literature review aims to examine the current state of research in eye-tracking, subtitling, and multilingualism, focusing on studies that have used eye-tracking to investigate the effects of subtitling on multilingualism. This will be done in light of the current study. It should be noted that studies with deaf and hard-of-hearing subjects have been excluded in this review as they do not pertain to the current study.

Eye-tracking technology has been used extensively in research on reading and language processing. Eye-tracking allows researchers to track eye movements during reading, providing insights into the cognitive processes involved in comprehension. For multilingual readers, eye-tracking offers a unique opportunity to investigate the cognitive processes of reading subtitles in a second language. Several studies have used eye-tracking to investigate the effects of subtitling on multilingualism.

A study by Kruger, Hefer and Metthew (2013:65) examined the effects of subtitling on first-language (L1) and second-language (L2) English speakers' visual attention. The study used eye-tracking to determine how participants' visual attention was divided between on-screen text (in the form of subtitles) and visuals. It found that there is definitely a great need for L1 and L2 subtitles in academic settings. The authors also considered cognitive load in multilingual educational settings, suggesting that it may occur when viewers are forced to divide their attention between information sources, especially if some of these sources are superfluous (Kruger et al., 2013:65). They found that subtitles, however, do not necessarily contribute to cognitive overload. The concept of cognitive load is discussed in detail in the results and findings section of this article.

Another relevant study based in South Africa is that of Matthew (2019:iii). It considers how subtitles impact cognitive load by measuring participants' information-processing abilities and the impact of various subtitles using eye-tracking as a method to measure this data. This study found that subtitles do not impact cognitive load significantly.

Matthew (2020:1) also investigated the impact of same-language subtitles (SLS) on "non-native" English speakers in South Africa. This study focused specifically on viewers in an e-learning setting and found that subtitled content had "...no significant effect either on

performance or on perceived cognitive load for the students watching a recorded lecture with added subtitles compared to watching without subtitles” (Matthew, 2020:1).

Lacroix (2012:5) focused on the effects of SLS on comprehension for students who spoke English as an additional language in a South African context. The study found that SLS are helpful in the context of discipline-specific comprehension, especially if viewers are made comfortable with subtitles as a mode of academic intervention.

Kruger and Kruger (2004:113) concluded in their study that subtitling could potentially direct attention to issues connected specifically to language (particularly in the case of institutions where English is the medium of instruction). These issues include “...inaccessibility of information and illiteracy”, and the authors assert that addressing these issues will aid “...in the implementation of language rights and the promotion of multilingualism” (Kruger & Kruger, 2004:111). This assertion highlights another important benefit of subtitled material in multilingual education settings in South Africa, namely, improved inclusion of those who have been previously excluded from certain forms of information due to language barriers (Kruger & Kruger, 2004:113).

Lastly, Kruger and Steyn (2013:105) investigated, through eye-tracking, the impact of SLS on academic performance. The study concludes that SLS do have a positive impact on comprehension and could therefore be a useful tool for “...reading instruction and language learning” (Kruger & Steyn, 2013:105).

The present study differs from the various South African studies above in that subtitles other than exclusively SLS were used. Due to the participation of L2 students in the present study, their viewing interactions could also be measured with eye-tracking technology. By focusing on multilingual subtitles, this study is set apart from other studies in the South African higher education context.

3.2.1 Subtitle eye-tracking and its importance for multilingual students

The present study highlights that academic subtitles, in conjunction with eye-tracking studies, can be important for multilingual students for several reasons, including comprehension and retention, language acquisition, and visual attention.

For students who are studying a discipline in which they are inexperienced or a discipline with many new terms, watching videos with subtitles can be a helpful tool for improving comprehension, especially for L2 students. However, if the students are struggling to keep up with the subtitles, they may miss important parts of the content (Van Der Zee, Admiraal, Paas, Saab & Giesbers, 2017:5). Eye-tracking studies can help identify where students are looking on the screen and how much time they spend reading subtitles, which can provide insights into how to optimise subtitle design for improved comprehension and retention of important information.

Multilingual students can improve their language acquisition skills through subtitle reading (Koolstra & Beentjes, 1999:51). Eye-tracking can help identify where students are looking on the screen, how much time they spend reading subtitles, and which parts of the subtitles they find most challenging. The current study provided its seven participants with subtitles in English, Afrikaans, isiZulu, and Sepedi. Among the participants, five were English L1 speakers, while two were English L2 speakers. Tracking the L2 participants' eye movements as they watched videos subtitled in both English and their L1 proved useful in determining which parts of the English subtitles they struggled with. There are, therefore, seven data points in total for the videos subtitled in English. Examples will be provided in the methodology section below.

Eye-tracking can also provide insights into students' visual attention and focus. If students are struggling to keep up with subtitles or are distracted by other elements on the screen, this can impact their overall comprehension and engagement (Karamitroglou, 1997:1). Eye-tracking can help identify areas where students may be losing focus, which can inform instructional strategies and video design.

Overall, subtitle eye-tracking can provide valuable information for optimising subtitle design to improve comprehension and retention, language acquisition, and visual attention for multilingual students.

3.3 Method

Eye-tracking is a technology used to measure the movement of a person's eyes and understand where they are looking. This technology works by using special cameras and software to track the position and movements of the eyes in real-time (Carter & Luke, 2020:59).

3.3.1 How eye-tracking works

The most common method of eye-tracking uses infrared light to illuminate the eye, which is then detected by a camera or cameras placed around the viewer's head. These cameras capture the reflection of the infrared light on the cornea and pupil, which allows the software to determine the exact position of the eye in three dimensions (Carter & Luke, 2020:53). In the present study, the Tobii X3-120 eye-tracking device was used. The software then uses this information to create a gaze map or gaze plot, which shows where the user is looking on a screen or in their environment (Santhoshikka, Laranya, Harshavarthini et al., 2021:126). This map can be used to understand how the user is interacting with digital content, in this case, an academic video. The equipment can also record data about the timing and location of fixations and saccades, as well as measuring other eye-related parameters, such as blink rate, pupil dilation, and fixation duration (Carter & Luke, 2020:54). These parameters can provide additional insights into the viewer's behaviour and engagement.

Fixations and saccades are two important concepts in eye-tracking. A fixation is a period of time when the eye is relatively still and focused on a particular location or object. During a fixation, the eye is able to extract visual information from the environment, and this information is sent to the brain for processing (Carter & Luke, 2020:59). Typically, fixations last between 100 and 300 milliseconds, although they can be longer or shorter depending on the task or context (Galley, Betz & Biniossek, 2015:1).

A saccade is a rapid, jolting movement of the eye that shifts its focus from one point to another. Saccades are used to move the fovea (the central part of the retina that provides the clearest and most detailed visual information) to different locations in the visual field so that new information can be processed (Carter & Luke, 2020:57). Saccades typically last between 20 and 200 milliseconds, depending on their length and direction (Rayner, 2009:1459).

3.3.2 The use of eye-tracking technology in the present study

The present study was conducted among seven participants in a faculty of natural and agricultural sciences at a South African university. The participants were shown a discipline-specific video from one of their animal anatomy modules with subtitles available in English, Afrikaans, isiZulu, and Sepedi. Due to the demographics of the class from which participants

volunteered, the only English L2 speakers who participated in the study were Afrikaans L1 speakers. Therefore, the isiZulu and Sepedi subtitles were unfortunately not utilised during this particular study.

Before the video commenced, participants were introduced to the Tobii X3-120 eye-tracking device. The participant would place the eye-tracking glasses linked to the device on their face, after which they were asked to focus on a specific image so that the device could be calibrated to their eyes. Once the device was calibrated and the participant was comfortable, the video began.

The English L1 participants only watched the video with English subtitles, while the English L2 speakers alternated between Afrikaans and English subtitles. The participants were allowed to view the video more than once. After watching the video, all participants were asked a series of questions relating to the content discussed in the video, the contents of the subtitles, and events in the video. Below are the questions participants were asked. Participants were provided with answers in multiple-choice format. The correct answers have been bolded:

Post-Video Questionnaire: Short Questions

1. What is the cavity between the teeth and the tongue of an animal called?
 - A. *Cavum oris*
 - B. *Cavum nasi*
 - C. Uvula
 - D. Soft palate

2. When the presenter discusses palpation, can you remember whether he palpates the animal's lumbar region with one hand, or both hands?
 - A. He uses one hand
 - B. He uses both hands**

3. Does the presenter wear glasses in this video?
 - A. Yes, he does**
 - B. No, he does not

4. Are the Peyer's patches ever shown in this video?
 - A. No, they are not shown
 - B. Yes, they are shown**

Figure 1: A list of short questions presented to participants after watching a subtitled, discipline-specific video

Once each participant had finished watching the video and completed the short questions, heat maps and gaze plots of their eye movements were generated using the program Tobii Pro Lab, version 1.194 (Tobii Pro AB, 2014: n.p.). The results garnered from these heat maps and gaze plots will be analysed in the results and findings section of this paper. Below are examples of a gaze plot (Figure 2) and a heat map (Figure 3) produced by Tobii Pro Lab:



Figure 2: An example of a gaze plot generated by the Tobii Pro Lab Program, Version 1.194

Figure 2 shows a gaze plot generated by Tobii Pro Lab based on the subject-specific video shown to participants in this study. Gaze plots are a type of visualisation used in eye-tracking studies to display the eye movement patterns of a person while they are engaged in a particular task, such as reading or viewing a video. Gaze plots provide a detailed view of where a person's eyes are fixating and how long they are fixating on each location (Santhoshikka et al., 2021:126).

To create a gaze plot, the eye-tracking software records the position of a participant's gaze over time as they view a stimulus, in this case, a subject-specific video. The resulting data is then plotted as a series of dots or circles on a grid that represents the visual stimulus. Each circle on the grid represents a fixation or a period of time when the participant's eyes were stationary on a particular location (Santhoshikka et al., 2021:128).

The size of each circle corresponds to the duration of the fixation, with longer fixations represented by larger circles. The location of each circle indicates the position of the person's gaze during the fixation. Each participant is represented by a different colour on the gaze plot,

and the order in which they viewed each stimulus is indicated by the numbers inside each circle on the gaze plot.

By examining gaze plots, researchers can gain insight into a viewer's visual processing and attention allocation processes. The gaze plots generated from the current study have been valuable in the process of identifying patterns of fixation that suggest particular areas of interest or points of confusion in the video. This information can also be gathered from heat maps, as shown in Figure 3 below:



Figure 3: An example of a heat map generated by the Tobii Pro Lab Program, Version 1.194

Similar to gaze plots, heat maps (Figure 3) are generated in eye-tracking by recording and analysing the movements of a viewer's eyes as they view a visual stimulus. The eye-tracking device records the gaze data, which includes the location and duration of fixations (when the eyes are relatively stationary and focused on a specific point), saccades (when the eyes move quickly between different points), and blinks (Santhoshikka et al., 2021:127).

To generate a heat map, the gaze data is aggregated and visualised using a colour scale that represents the intensity of eye movements in different areas of the stimulus. Typically, areas of the stimulus that receive more or longer fixations are represented by warmer colours (e.g., red, orange, or yellow), while areas with fewer or shorter fixations are represented by cooler

colours (e.g., green). The resulting heat map provides a visual representation of the areas of the stimulus that captured the viewer's attention and engagement.

In the following section, heat maps and gaze plots generated by Tobii Pro Lab will be analysed in relation to participants' responses to post-video questions (Figure 1).

3.4 Results and discussion

The questions participants were asked after viewing the video (Figure 1) related to both the content discussed in the video itself and certain events or images in the video. This was done to determine whether there was any correlation between where participants focused their attention in the video and their ability to comprehend and recall specific information and events from the video.

This section will examine the L1 participants' responses to some of the questions in Figure 1 in relation to their gaze plot and heat map activity. This information will then be compared to the responses of the L2 participants. It should be noted that, as mentioned earlier in this paper, the L2 participants watched the video with both English subtitles and subtitles in their L1. There are, therefore, seven total data points for the English-subtitled videos.

3.4.1 Participants' responses to the first questionnaire question (Figure 1)

For each questionnaire question, responses to each question in Figure 1 after watching the video subtitled in English were recorded. These answers were then compared to those of the L2 participants after watching the video with Afrikaans subtitles, after which the heat maps and gaze plots produced by Tobii Pro Labs have been analysed based on screenshots from the particular time stamp in the video to which each question refers. Participants are numbered P1 to P7, and when referring to their viewing of the video with Afrikaans subtitles, the English L2 speakers are numbered P1 (L2) and P2 (L2).

Four of the participants (57,14%) did not answer question 1 ("What is the cavity between the teeth and the tongue of an animal called?") correctly. Examining their viewing activity using both the gaze plots and heat maps created by Tobii Pro Labs gives an insight into why these participants might have answered the question incorrectly.

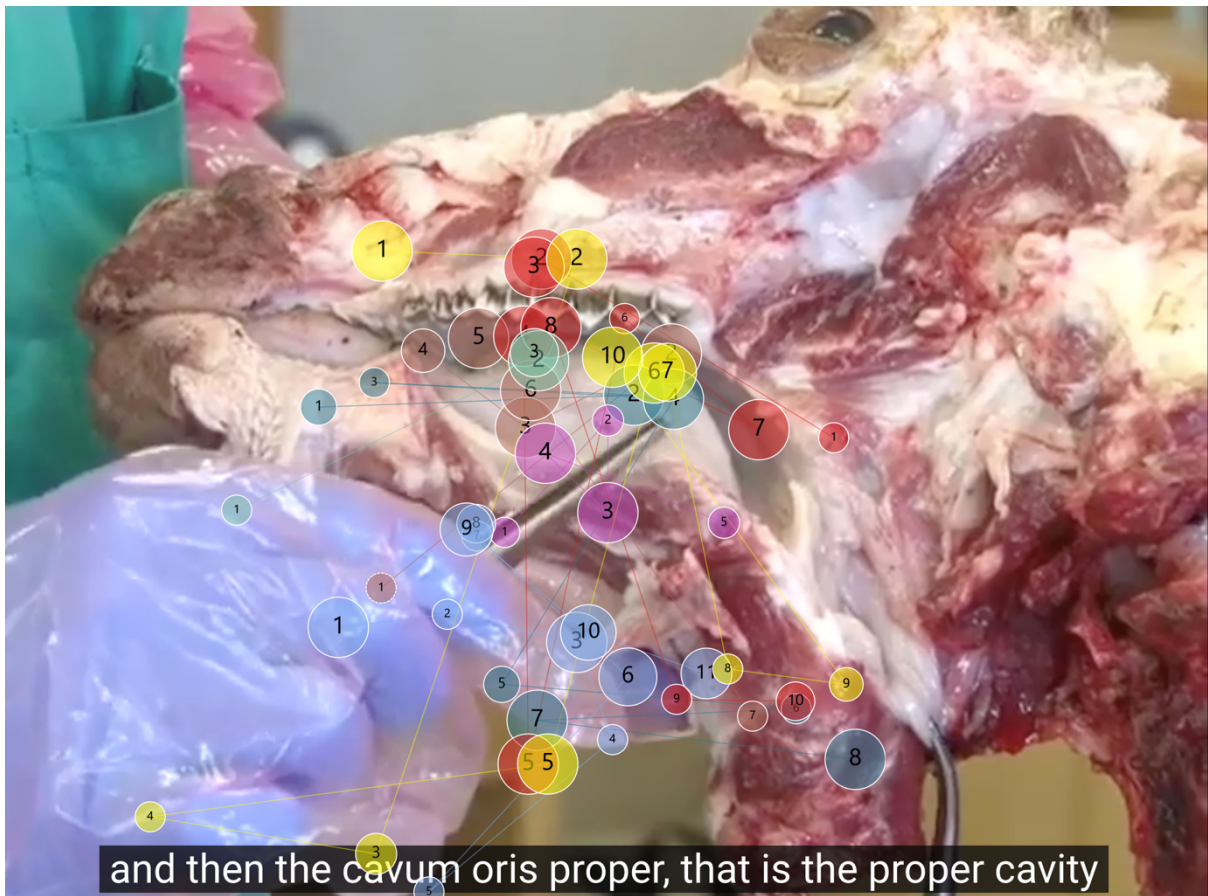


Figure 4: A gaze plot showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 1 (Figure 1)

As is shown in Figure 4, the participants watching the video subtitled in English did not fixate on the subtitles in this section of the video for very long. The only participants who paid attention to the subtitles were P3 (light blue) and P5 (yellow). Both of these participants answered the question correctly. However, these participants did not fixate on the subtitles for very long, as is indicated by the size of the fixation circles in Figure 4. Most of the participants seemed to focus on where the presenter was pointing. This correlates with the corresponding heat map from this section of the video:

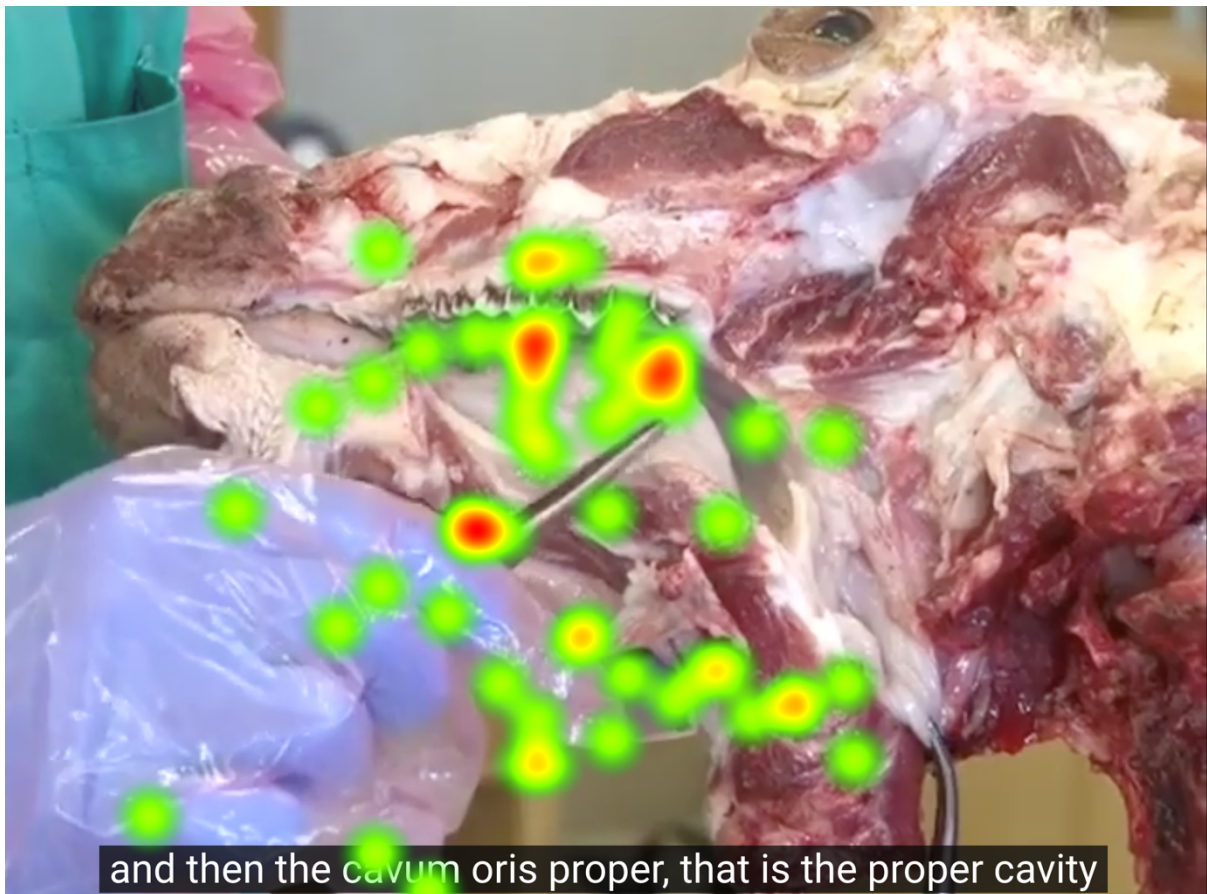


Figure 5: A heat map showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 1 (Figure 1)

Interestingly, as indicated by the percentage of correct answers in given to question 1, most of the participants could not remember the name of the structure discussed in the section of the video illustrated in Figures 4 and 5, even though they were fixated on its image, as indicated by the red areas of the heat map in Figure 5. However, the participants who did pay attention to the name of the discussed structure in the subtitles were able to name it correctly after the video had ended, even though they did not fixate on the information for long, as indicated by the green areas over the subtitles in Figure 5. This could indicate that engaging with academic subtitles does assist content recall and possibly comprehension on some level.

2.4.1.1 Absence of L2 data for question 1 of the questionnaire

For question 1 of the questionnaire (Figure 1), only data for the English-subtitled version of the video is available. This is because both of the Afrikaans L1 participants switched back to English subtitles at different points in the video. This phenomenon proves to be interesting

when considering the rise of technomultilingualism (Ndlangamandla, 2022:450). While technomultilingualism may involve code-switching or code-mixing (in writing, in this case), it could be applied in this instance as well, as the L2 students preferred to switch back and forth between English and Afrikaans subtitles (Ndlangamandla, 2022:450). However, it must be considered that this behaviour may also be due to social pressures and expectations that people should be proficient in reading and understanding English, especially if they are studying at an English-medium higher education institution. Some people may also feel embarrassed because they believe that it is a basic skill that they should have already mastered, and this may not be something that the participants would freely admit to the researcher. It may be that students would prefer to engage with subtitles in their home language in an environment where they are afforded privacy and feel free from societal judgement.

However, cognitive load also must briefly be discussed in this context. Cognitive load refers to the amount of mental effort or resources required to process information in working memory. In other words, it refers to the amount of mental “labour” involved in learning or completing a task (Kruger et al., 2013:62). Cognitive load theory suggests that there are limits to how much information the human brain can process at once. When the cognitive load is too high, it can lead to decreased performance, difficulty in learning, and mental fatigue (Kruger et al., 2013:63).

Cognitive load is an important consideration here, as the English subtitles for question 1’s section of the video were longer (57 characters, 1 line) than the Afrikaans subtitles for this section (48 characters, 1 line). Despite their longer length, however, the L2 participants still preferred to engage with the English subtitles in this particular part of the video. This behaviour concurs with the assertion by Kruger et al. (2013:65) that SLS in educational settings do not lead to heightened cognitive load but rather minimise it.

3.4.2 Participants’ responses to the second questionnaire question (Figure 1)

The purpose of question 2 in the questionnaire (“When the speaker discusses palpation, can you remember whether he palpates the animal’s lumbar region with one hand, or both hands?”) was to determine whether the subtitles posed a distraction to the participants when they were not necessarily as important as the image on the screen. This is an important exercise as students need to be able to engage with the technological tools and interventions provided to

them, but they must also be able to engage with the content itself without being distracted by the interventions.

Six of the L1 participants (85,71%) and both of the L2 participants had no issue remembering the visual information they were asked about in question 2 (Figure 1). This correlates with their fixation data in both the gaze plot and the heat map that were generated based on this section of the video (Figures 6 and 7, respectively).



Figure 6: A gaze plot showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 2 (Figure 1)

As can be seen in Figure 6, the participants' attention was mostly focused on the presenter's hands and not on the subtitles on the screen. In this case, the subtitles only acted as a transcription of what was said in the video and did not contain any important terminology. Because the participants' fixations were on the presenter's actions, they were able to recall them. Additionally, however, this data could also be an example of the fact that the subtitles did not distract the participants from important information that was being relayed on the screen (Vanderplank, 1988:275). Therefore, the subtitles were clearly not a hindrance to their

comprehension and recall in this instance. The heat map generated by Tobii Pro Lab solidifies these findings (Figure 7):



Figure 7: A heat map showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 2 (Figure 1)

As is visible in Figure 7, the participants largely fixated on the actions of the presenter in the video when it was required of them, and their fixation duration on the subtitles was shorter, showing that they were not distracted by the presence of the subtitles in this instance.

2.4.2.1 L2 Participants' responses to the second questionnaire question (Figure 1)

Both of the L2 participants in the study also managed to answer question 2 of the questionnaire correctly. While the heat map distribution of the L2 participants' viewing activity is very similar to the distribution in Figure 7, the gaze plot produced by the L2 participants' viewing activity in the context of question 2 is interesting (Figure 8):



Figure 8: A gaze plot showing participants' viewing activity in relation to the Afrikaans-subtitled video's content which relates to question 2 (Figure 1)

As can be seen in Figure 8 above, P1 (L2) (indicated in pink) fixated on the subtitles for some time; however, as indicated by the numbers inside the fixation circles, the subtitles were one of the last things the participant looked at in this instance. P2 (L2) (indicated in blue), however, did not consider the subtitles at all. This could show that even with translated subtitles, the participants were not distracted from important information being disseminated on the screen.

3.4.3 Participants' responses to the third questionnaire question (Figure 1)

Question 3 of the questionnaire ("Does the presenter wear glasses in this video?") (Figure 1) serves a similar purpose to question 2 and will, therefore, not be discussed at length. The goal of the question was to determine whether participants were able to recall more subtle information in the video, even if subtitles were present. Five of the L1 participants (71,43%) managed to answer question 3 correctly. Interestingly, this was a section of the video where one of the L2 participants, once again, decided to engage only with the English subtitles and did not view the Afrikaans subtitles at all. The L2 participants' results were thus excluded for

this question. The heat map of the L1 participants' viewing patterns illustrates the reason for this (Figure 9 below).



Figure 9: A heat map showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 3 (Figure 1)

As illustrated in Figure 9, the participants mostly did not focus on the presenter's face for long but rather on important terms in the subtitles (e.g., “palpate” and “omasum”). In spite of this, they were largely able to recall the subtle detail that the presenter wore glasses, showing once again that they were not overly distracted by the subtitles (Vanderplank, 1988:275).

3.4.4 Participants' responses to the fourth and fifth questionnaire questions (Figure 1)

The fourth and fifth questions in the post-video questionnaire served similar purposes: to determine whether the subtitles in the video promote comprehension and language acquisition among students. The participants' comprehension and language acquisition was measured by these two questions in that they were introduced to new discipline-specific terms (as in question

1), and these questions sought to measure their ability to engage with, recall, and understand these terms. The participants' responses to question 4 (“Are the Peyer’s patches ever shown in this video?”) and question 5 (“The cavity which contains the animal’s small and large intestines, as well as the uterus in a pregnant female animal, is called:”) yielded the following results:

Once again, only one of the L2 participants made use of the Afrikaans subtitles for question 5. The responses of the L2 participants were, therefore, not taken into account for question 5; however, they did yield usable data in their responses to question 4. Six of the L1 participants (85,71%) answered question 4 correctly, while only one of the L2 participants answered question 4 correctly. However, only two of the L1 participants (28,57%) managed to answer question 5 correctly. Figures 10 and 11 below show gaze plots of the L1 and L2 participants’ viewing activity in relation to question 4, respectively.

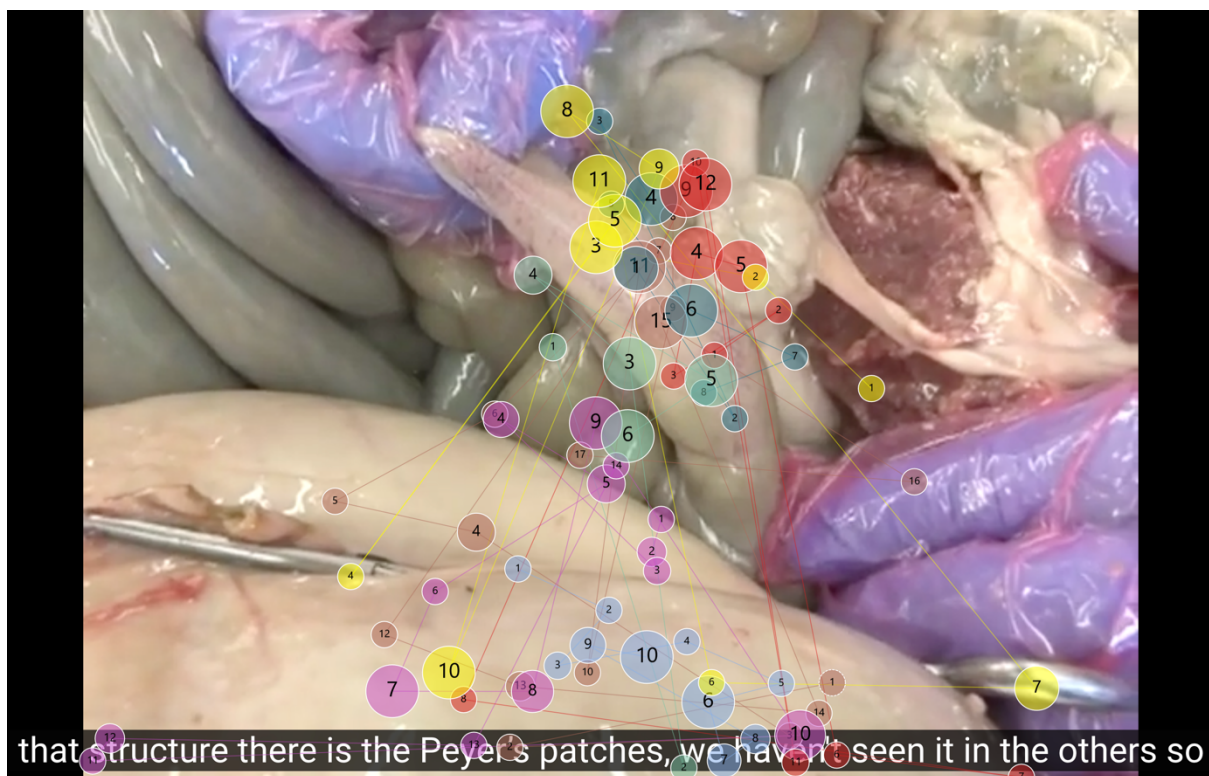


Figure 10: A gaze plot showing participants’ viewing activity in relation to the English-subtitled video’s content which relates to question 4 (Figure 1)

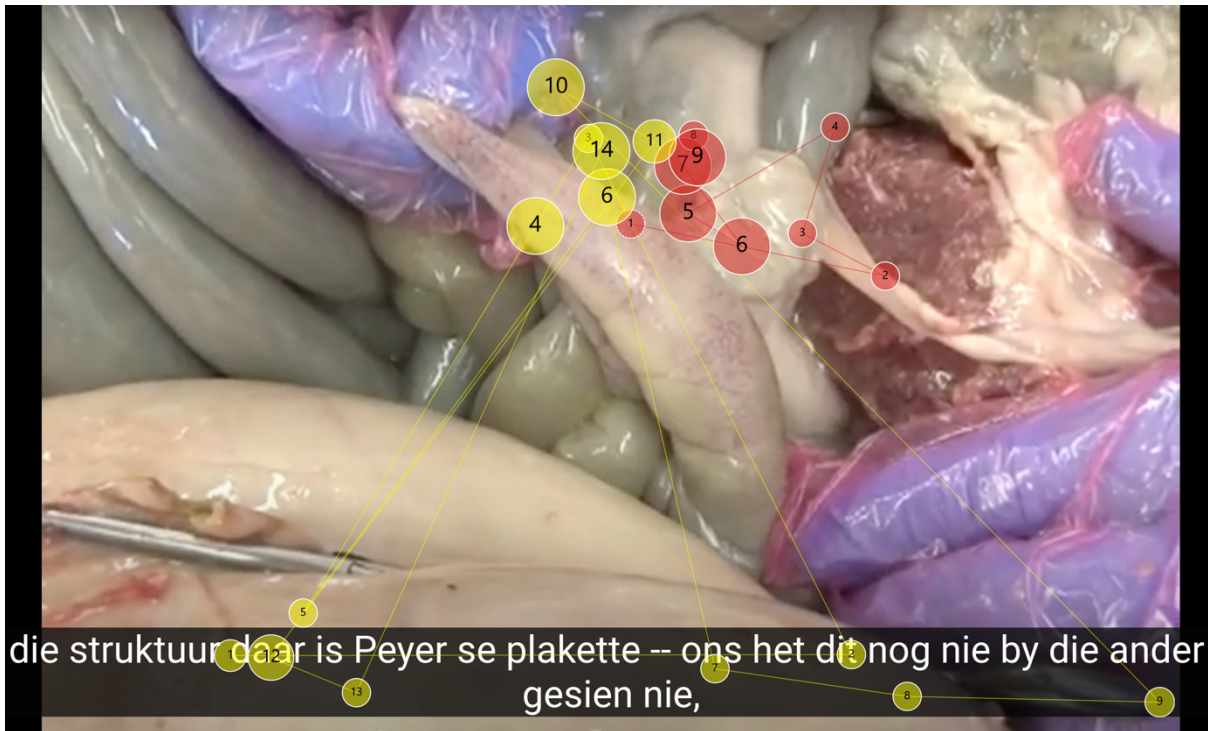


Figure 11: A gaze plot showing participants' viewing activity in relation to the Afrikaans-subtitled video's content which relates to question 4 (Figure 1)

Figure 10 indicates that the L1 participants' focus was mixed: some focused on the important term ("Peyer's patches") in the subtitles, while most focused on the structure itself as it appeared on the screen. The participants' fixation on the subtitles was also short, as indicated by the smaller fixation circles shown in Figure 10. However, the L1 participants were still largely able to answer question 4 correctly, which required them to simply remember whether the Peyer's patches were shown in the video. This question required a simple "yes/no" response from the participants, and their engagement with and fixation on the structure on the screen enabled them to respond correctly.

The researcher puts forward that P1 (L2) was able to respond correctly to question 4 because of the participant's balanced engagement with the on-screen image and the subtitles. Figure 11 shows that P1 (L2) (indicated in yellow) spent some time fixating on the subtitles relating to question 4, while P2 (L2) (indicated in red) did not consider the subtitles at all and could not respond to question 4 correctly. In this context, the subtitles were useful, in terms of subject matter recall, to the L2 participant who made use of them.

The participants' responses to question 5, however, differ rather drastically from question 4. As previously noted, only 28,57% managed to answer question 5 correctly. There are a number

of possible reasons for this. Firstly, the question was not as straightforward as question 4 and required the participants to remember the Latin name of a structure that was discussed in the video. This required them not only to recall what they saw in the video but also to understand its content. Secondly, question 5 was phrased in a more complex way than question 4: “The cavity which contains the animal’s small and large intestines, as well as the uterus in a pregnant female animal, is called:”. The phrasing of the question required the participants to carefully consider their answers and think back on the content of the video before providing a response. Lastly, as shown in Figure 12 below, the participants focused mainly on the structure shown on the screen and not on the subtitles.

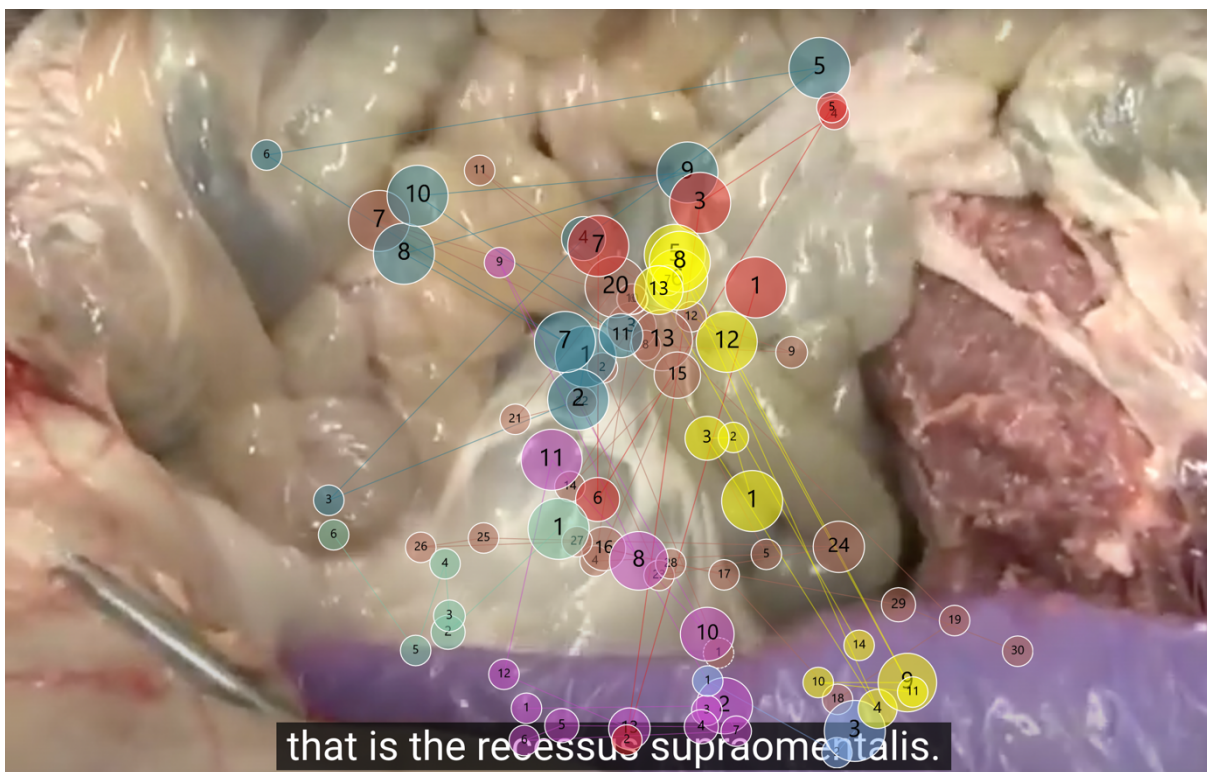


Figure 12: A gaze plot showing participants’ viewing activity in relation to the English-subtitled video’s content which relates to question 5 (Figure 1)

Figure 12 illustrates that only P1 (indicated in pink) and P2 (indicated in light blue) fixated on the subtitles relating to question 5. P7 (indicated in dark red) only fixated on the subtitles for a short time, but P7’s attention did not return to the subtitles. The researcher puts forward that P1 and P2 were able to answer question 5 correctly because they fixated on and returned to the subtitles, and this allowed them to engage with, recall, and understand the subject matter in its

context. Figure 13 below is a heat map of the participants' viewing activity relating to question 5:



Figure 13: A heat map showing participants' viewing activity in relation to the English-subtitled video's content which relates to question 5 (Figure 1)

The heat map in Figure 13 illustrates how P1 and P2 fixated on both the subtitles and the structure shown on the screen. In terms of P1 and P2's fixations on the subtitles, the participants tended to pay no attention to known words ("that", "is", "the") and fixated only on the newer, more unfamiliar term in the subtitle ("*recessus supraomentalis*"). The researcher therefore puts forward that, as correlated by Figures 12 and 13, P1 and P2 were able to answer question 5 correctly because they focused specifically on the important terminology in the subtitle in conjunction with the structure discussed on the screen.

3.5 Conclusion

The use of subtitling and eye-tracking technology has shown great potential in promoting comprehension and language acquisition in multilingual settings. The research findings in this context have highlighted the effectiveness of subtitling and eye-tracking technology in facilitating language acquisition and comprehension.

One of the major advantages of subtitling is that it provides an effective means of improving the subject matter recall skills of individuals in multilingual settings. Subtitling can help learners understand the context and meaning of unfamiliar words by providing visual cues. This is illustrated in Figure 14 below, which summarises the number of correct versus incorrect answers provided by the L1 and L2 participants in the study in conjunction with the subtitle interaction each question received.

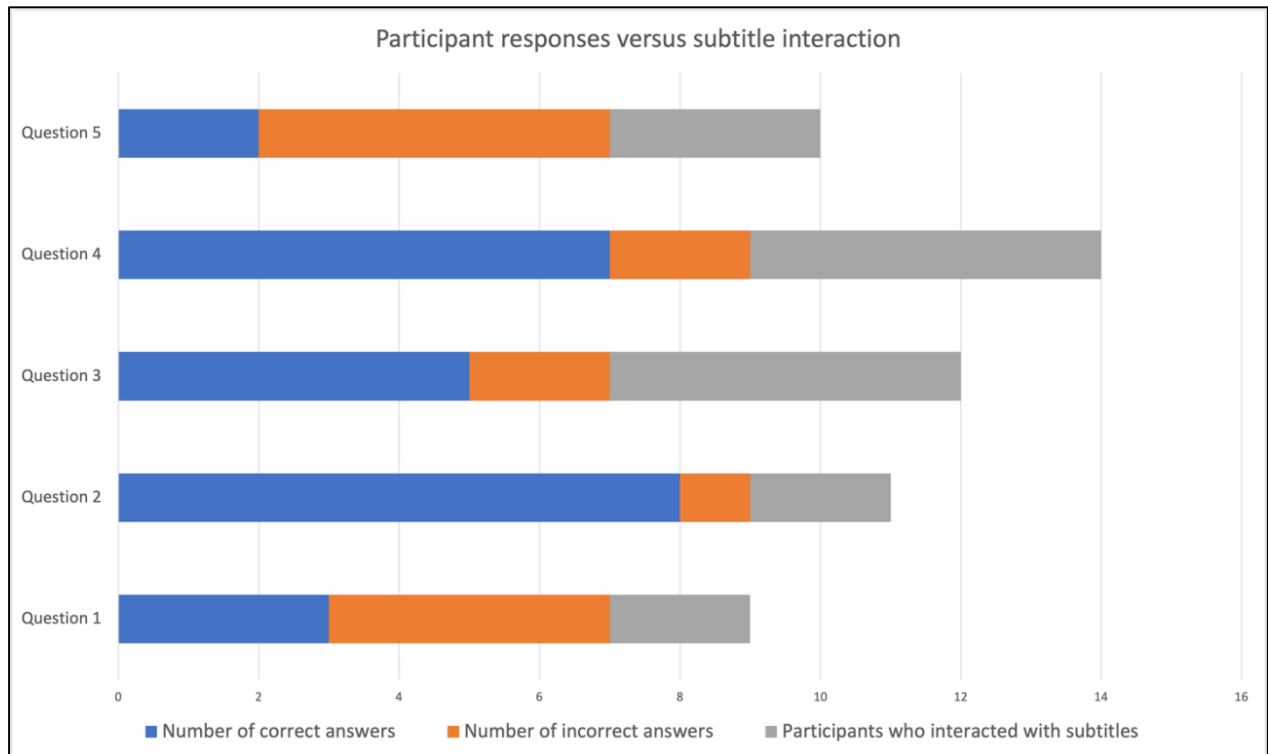


Figure 14: A bar graph illustrating participants' correct/incorrect responses to the questionnaire questions in relation to how many participants interacted with the subtitles of each question

As is shown in Figure 14, the participants were often more likely to answer a question correctly if they had engaged with the subtitles. There were some questions where the subtitles were not the focus of the question, however, and therefore, the participants' subtitle interaction did not necessarily link to their ability to answer the question correctly (e.g., questions 2 and 3). However, even though the sample size for this study was small, the results show that subtitling can be beneficial to students' comprehension and language acquisition, especially in multilingual settings.

Eye-tracking technology was used in this study to examine whether subtitles can promote language acquisition and comprehension. This technology has provided the researcher with the

ability to study how individuals process information and understand language. It was used to investigate the cognitive processes involved in reading and language comprehension when viewers engage with subtitles. The findings of this study show that eye-tracking in subtitled videos can be beneficial when considering how individuals process information and comprehend language, as their viewing activity and subtitle interaction can be very clearly measured.

Moreover, the use of subtitling and eye-tracking technology can also promote inclusivity in multilingual settings. These technologies can be used to provide access to content for individuals who are deaf or hard of hearing or those who are not English L1 speakers. Although the isiZulu and Sepedi subtitles were not used by the participants in this study, they are still useful and necessary for English L2 speakers, especially in higher learning institutions where English is the main medium of instruction.

Despite the numerous benefits of subtitling and eye-tracking technology, there are also some limitations that need to be considered. One limitation of subtitling is that it can be distracting for some individuals; however, this study has shown, albeit with a small sample size, that most viewers do not experience subtitles as a distraction. The small sample size available to the researcher is another limitation that must be considered. The data gathered in this research is, unfortunately, not representative of a large population, but it does provide valuable insights into how subtitles may be applied in academic settings to promote subject matter comprehension and language acquisition among students.

In conclusion, this study has indicated that the use of subtitling and eye-tracking technology has shown great potential in promoting comprehension and language acquisition in multilingual settings. These technologies can be used to improve subject matter recall, aid in vocabulary acquisition, promote comprehension, and provide access to content for individuals who are deaf, hard of hearing, or not English L1 speakers without imposing a high cognitive load on viewers. However, it is important to consider the limitations of the study and address these limitations in order to promote the accessibility and effectiveness of subtitling as a practice and eye-tracking technology as a tool to measure the effectiveness of subtitling. Further research is needed to explore the full potential of subtitling and eye-tracking technology in promoting language acquisition and comprehension in multilingual settings, specifically with larger, more representative sample sizes.

Chapter 4: Academic and plain English word lists: The development of parallel word lists for undergraduate students in the natural and agricultural sciences

Abstract

Subtitles in tertiary education can be used to address language inclusivity at universities (DHET, 2020:17). Plain English and keyword subtitles are proposed to mediate barriers to language inclusivity. When considering the effectiveness of academic English as opposed to plain English subtitles, it is essential to explore which approach is more beneficial for university study, particularly in the context of discipline-specific videos. To achieve this in the present study, word lists have been created and evaluated based on the two types of subtitles. This study uses a corpus-based approach to create word lists based on subtitles with the aim of investigating how subject-specific terms are organised and used in context.

The main finding of this paper is that plain English subtitles and an accompanying word list clarify scientific and technical terms, especially when used with subtitling conventions. This research shows, however, that changes should be implemented to plain English subtitles in cases where they could not adhere to specific conventions. Plain English subtitles which follow an approximation of subtitling conventions produce clearer subtitles.

This paper also discusses how the academic subtitles used in this study have been identified as “academic”, as they contain mostly subject-specific terms (often in Latin and Greek), the meaning of which is often not transparent to second-language speakers. The development of a parallel word list in plain English can aid students as they study the subject-specific vocabulary of specialised fields.

Keywords: Academic vocabulary, language inclusivity, plain English, subtitling, subtitling conventions, technical terms, undergraduate students, word lists.

4.1 Introduction

Subtitles and academic word lists are two valuable resources that can greatly benefit students in the sciences. The link between these two tools facilitates comprehension and proficiency in various academic disciplines. On one hand, subtitles can serve as a bridge between spoken and written language, making it easier for students to grasp complex scientific content presented in lectures, videos, and presentations. This auditory-visual synergy is invaluable for students as it reinforces their understanding and retention of scientific knowledge. Academic word lists, on the other hand, offer a carefully curated selection of high-frequency words used in academic texts and scientific literature. These word lists are specifically designed to enhance students' academic vocabulary, equipping them with the terminology necessary for comprehending scholarly articles, research papers, and textbooks. For students at tertiary level, a robust academic vocabulary is essential to engage with and contribute to the ongoing discourse in their respective fields (Coxhead, 2000:228). The focus of this paper involves the creation of academic and plain English word lists based on subtitled academic videos from a module in the Natural and Agricultural Sciences (NAS) at the University of Pretoria. The academic videos contained three sets of subtitles: academic English, plain English and keyword subtitles in aiding students' comprehension of the academic content. This study discusses which approach is more advantageous for tertiary study, particularly in the context of discipline-specific videos, to determine the efficiency of academic English versus plain English subtitles. In order to do this in the current study, word lists have been developed and assessed based on the aforementioned categories of subtitles. This study examines how subject-specific vocabulary is organised and used in context by creating word lists based on subtitles using a corpus-based approach (Kennedy, 1998:17).

Driven by the language clause in the Constitution of the Republic of South Africa, Act 108 of 1996 (Republic of South Africa, 1996), local researchers have investigated the use of subtitles in education settings (Kruger & Rafapa, 2002:n.p.; Kruger & Kruger, 2004:111; Ayonghe, 2009:iii; Hefer, 2011:1; Lacroix, 2012:1; Mahlasela, 2012:12; Kruger-Roux & Angu, 2020:63). Subtitles in tertiary education can be used to address issues of language inclusivity at universities (Department of Higher Education and Training, 2020). Plain English and keyword subtitles are proposed to mediate barriers to language inclusivity.

This paper will discuss how academic and plain English word lists in the natural sciences are created and compared as a base for the development of subtitles. In a previous paper (chapter

2 of this thesis), I focused on subtitle reception among NAS students at the University of Pretoria. A series of videos in these students' animal anatomy course were subtitled in the original (academic) English, as well as with plain English and keyword subtitles. The plain English subtitles were created by editing the academic English subtitles to ensure they follow the guidelines set out by Cutts (2020:xxiv). The focus of the current paper is on the development of these subtitles, the end product of which is the word lists in Appendices A and B. To aid the development of the word lists, the present study is based on the methodology used for a corpus-based analysis of the subtitles and their plain English counterparts (Prieels, Delaere, Plevoets and De Sutter, 2015:209).

This paper includes a discussion of the benefits of subtitles in South Africa's multilingual educational context and an explanation of how the word lists were prepared and informed by corpus-based studies. Furthermore, the principles of plain English and their relation to the subtitling context of this study will be considered, along with the practical application of a corpus-based study to the field of academic subtitling. Kennedy (1998:1) defines a corpus as "... a body of written text or transcribed speech which can serve as a basis for linguistic analysis and description". A corpus-based approach enables the creation of word lists to understand academic language in use (Kennedy, 1998:1).

4.2 Literature review

Educational settings in South Africa deal not only with differences in register between academic and colloquial language, primarily in English, but also with students from non-English speaking backgrounds (NESB). Whereas register may be the most important linguistic variable for students from English-speaking backgrounds (Prieels et al, 2015:210), NESB students must deal with not being taught in their home language. Considering this disadvantage, it is useful to point out the benefits of subtitled material in multilingual education in South Africa.

Firstly, Hefer (2011:7) points out that subtitles may provide improved decoding skills when reading. This may be because viewers who engage with subtitles are able to connect the spoken words with their written counterparts, which can help them better understand what is being said on-screen. She further notes that using subtitled material in a multilingual context "provides a natural learning situation" (2011:49), which could improve the reader's knowledge of the language in question. For example, if an academic video is provided in English with subtitles

in the student's mother tongue, Hefer's evidence suggests the student's understanding of English and the subject matter of their learning area will likely improve (Hefer, 2011:7).

Secondly, subtitled material in multilingual education settings in South Africa can improve students' reading comprehension (Kruger-Roux & Angu, 2020:64). This is beneficial because it brings to light "other ancillary issues such as readability of text and vocabulary issues" in a specific subject field (Mahlasela, 2012:30). This helps to justify the need for educational subtitling in South Africa, as Coetzee-Van Rooy (2009:18) points out that English is rooting itself as an international lingua franca. South Africans link English proficiency to "upward economic mobility ... education ... [and] liberation" (Coetzee-Van Rooy and Verhoef, 2000:164). Despite this reverence for the language, English proficiency levels are still low among South African speakers, especially second language speakers (Coetzee-Van Rooy and Verhoef, 2000:164; Schaefer and Kotzé, 2019:2). Interventions such as educational subtitling could aid in alleviating these issues.

Thirdly, subtitling could direct attention to issues connected to language (and particularly in the case of institutions where English is the medium of instruction (MOI)), which include "inaccessibility of information and illiteracy" (Kruger & Kruger, 2004:111). Kruger and Kruger also argue that addressing these issues will aid "in the implementation of language rights and the promotion of multilingualism" (2004:111). This assertion highlights another important benefit of subtitled material in multilingual education settings in South Africa, namely improved inclusion of those who have been previously excluded from certain forms of information due to language barriers.

Before exploring the use of plain English subtitles, it is important to understand what plain English is. Plain English is a style of writing which uses simple, unambiguous language to convey information (Cutts, 2020:xxiv). This style aims to communicate information in a way that is easy to understand, regardless of a reader's education or background. Plain English reduces ambiguity and makes information accessible to a wider audience, including those with lower literacy levels.

Several studies have been conducted on the use of plain English subtitles, with a focus on their effect on audience comprehension and engagement. One such study by Bernabé Caro and Orero (2019:55) investigates the possibility of plain English ('Easy to Read') subtitles to be used as an accessibility tool. The researchers conclude that plain English subtitles can improve

audience comprehension and should be used more widely in subtitling, especially as an accessibility measure which can be used in conjunction with existing technology.

Thrush notes that while, at the time of her writing, several studies on static plain English texts had been conducted, these were based on “non-technical” texts, and did not include language which would be encountered “in the workplace” (2001:292). Thrush suggests that further research is needed on “...how readers from different cultures and language backgrounds interact with texts, and how specific features of English technical writing facilitate or interfere with comprehension” (2001:292). It is proposed that viewers’ engagement with plain English subtitling is one way in which this facilitation or interference can be measured.

In addition to the use of plain English subtitles, there has been little research on the use of plain English conventions in subtitling. This study aims to broaden the existing research on this topic. Plain English conventions involve simplifying the language used in the subtitles to make them more accessible to a wider audience. This can include using shorter sentences, avoiding jargon and technical language, and using active rather than passive voice (Cutts, 2020:xxiv).

4.2.1 “Translating” subtitles into plain English

In relation to the translation of subtitles, Perego (2009:59) uses the term “explicitation” to describe an instance where the inferred information in a text is expressed more directly in the translated version of the text, “...without altering the source message, but making it clearer and more informative...”. According to Perego (2009:59), three types of “explicitation” contribute to the “codification of nonverbal information”: addition, reformulation, and specification. These types of “explicitation” also occur in the process of converting academic English to plain English and can therefore be applied in this context.

In terms of addition, Cutts (2020:57) notes that “verbal economy” is good plain language practice. However, since plain English conventions often call for the reduction of technical terms, these might need to be replaced with longer, more descriptive terms or even phrases. Since the videos in question were about animal anatomy, several Latin words and phrases were included in the verbatim academic English transcript. Initially, converting these Latin terms into plain English proved challenging, as the English definitions for these terms are often not nearly as concise as their Latin counterparts. These terms tend to “retain their foreignness” (Blamires, 2000:107).

Making a sentence more descriptive, with less technical language, often makes it clearer and more comprehensible, especially in scientific writing (Greene, 2013:36). In the present study, for instance, the term “nasopharynx” was changed to “upper part of the throat behind the nose” for the sake of clarity and comprehension (Appendix A). While “nasopharynx” embodies Cutts’ notion of “verbal economy” (2020:57), it is not necessarily a clear term that can be understood by all readers. In terms of subtitling standards, the phrase “nasopharynx” has been replaced with is longer than 35 characters per line (Karamitroglou, 1997:1). Perego asserts that at times, “...the important subtitling requirement for conciseness can be overruled by the need for explicitness and textual dilution” (2009:63). For this reason, the extension of the term “nasopharynx” justifiably adds meaning to the scene on the screen, and therefore this term and others like it have been expanded instead of shortened.

The concept of reformulation is used in the compilation of the plain English subtitles in this study. Reformulation sets out explicitly what is inferred by an on-screen speaker (Perego, 2009:63). Perego describes this notion as “...the tendency – or rather, the need – for subtitles to be self-contained and autonomous, as if they were the only information carrier for the viewers and the latter did not have access to other communicative channels” (2009:63).

In the context of subtitling videos in plain English for students in the natural sciences, the “over-use” of Latin and Greek terms should be avoided, as the goal of the plain English subtitles is accessibility. In NAS, Latin and Greek terms form a substantial part of scientific terminology (Madzimbamuto, 2012:132). However, this practice may be viewed as exclusionary, as it is often difficult for students to articulate themselves in a second or even third language, let alone an ancient language such as Latin (Madzimbamuto, 2012:132). The reduction of Latin terms in plain English subtitles is in line with the general plain English guideline of simplicity and avoiding wordiness (Cutts, 2020:57). Therefore, when revising the plain English subtitles, certain Latin terms in the original academic English transcript were changed into more straightforward English terms, as shown above. Although some of these terms are now longer than their Latin equivalents, they do provide more clarity. However, subtitling conventions have still been considered during the “simplification” of these terms. This means that each subtitle line still aims to contain about 35 characters per line to avoid font size reduction and a slower reading speed among the audience, as discussed in section 2.3 (Karamitroglou, 1997:1; Kruger, Wisniewska & Liao, 2022:211).

In many cases, the expansion of the plain English subtitles used in this study also serves the purpose of specification. Perego describes specification as “...substituting a lexical unit in the [source text] with a different one in the [target text] that is more precise...” (2009:59). Specification often serves the purpose of “deneutralising” certain terms (Perego, 2009:62), and serves the goal (consciously or not) of target text precision. While specification is often used in trans-cultural contexts, this principle could be applied to the academic English to plain English “translation” landscape. An example from the subtitles used in the current study is the change of “*foramen magnum*” to “hole in the skull where the spine goes through” (Appendix A). While the academic English term is more formal and “neutral”, the plain English phrase – while not informal – is more exact and easier to understand.

It is with this in mind that select terms in this study’s plain English subtitles were sometimes “reformulated”. For instance, in a video discussing an animal’s reproductive system, the speaker refers to the “perineum” of a male animal. For the plain English subtitles, this term was changed to “area between the genitals and the anus”. While not a fully scientific description, the expanded term elaborates on the speaker’s implied meaning, especially since reproduction is often a taboo subject for students from certain cultural backgrounds. The plain English phrase is more direct, which further aids in clarifying the term (and similar terms) for students.

4.2.2 Preparing a corpus-based analysis of academic English and plain English subtitles

Corpus linguistics is applicable to the study of media accessibility, especially in the field of subtitling. For subtitling purposes, corpus-based approaches have several benefits since they may be useful in examining the conventions used in subtitling (Baños, Bruti & Zanotti, 2013:487). In light of this, a corpus-based study of academic English subtitles and plain English subtitles should highlight any differences between the two types of English and could therefore act as a basis from which plain English subtitles in other fields can be developed.

Previously, corpus-based approaches have been applied to subtitling in the context of translation (Baños, Bruti & Zanotti, 2013:487). While academic English and plain English are not different languages, their conventions are nevertheless different, as illustrated in section 2.3. A parallel word list of both academic English subtitles and plain English subtitles is therefore useful in identifying “translation solutions”, just as it would be when working with languages other than English (Baños, Bruti & Zanotti, 2013:487).

In line with the corpus-based nature of the study, this paper follows the work of Van Rooy (2013:10), Díaz-Cintas (2004:50) and Gambier and Gottlieb (2001:viii), who focus specifically on corpus linguistics in a multiliterate context. Van Rooy (2013:10) notes that a particular challenge in the compilation of a corpus in Africa, and in South Africa specifically, involves taking into consideration the “... language proficiency and language backgrounds ...” of various groups. Van Rooy (2019:71) further points out that a lot of the South African corpora are already outdated, and South African educators would benefit from the development of new corpora with updated perceptions of how writing adapts to a changing society. Placing the focus of the current research on South Africa’s multiliterate context could therefore provide an updated corpus which takes South Africa’s diverse language backgrounds into account.

Another focus of this study is Lindquist’s (2009:1) work on corpus-based linguistics. Lindquist highlights why consulting corpora is useful to linguistic studies and describes corpus linguistics as “... a methodology ... with a certain outlook ... [indicating] that the rules of language are usage-based and that changes occur when speakers use language to communicate” (2009:1). Lindquist further notes that, if one is “... interested in the workings of a particular language ... it is a good idea to study [that language] in use” (2009:1). Subtitling, therefore, can be viewed as a useful tool for studying language in terms of how it is used and the context in which it is used. Corpus linguistics can be used to create academic word lists by analysing large collections of academic texts and identifying the most frequent and salient words used in academic discourse.

Academic word lists are compiled on the principle that they contain words which are not frequently seen in “non-academic” texts, but that these words “[occur] regularly throughout academic texts across all disciplines” (Cooper, 2017:134). Coxhead & Nation (2001:252) assert that English vocabulary can be split into four categories, and academic vocabulary forms one of these distinct categories. The other three categories include frequently used words, technical or subject-specific terms, and less frequently used words (Coxhead & Nation, 2001:252). The use of academic vocabulary and the compilation of word lists based on academic vocabulary must therefore take these four categories into consideration to ensure that words identified as academic conform to the requirements for that category. Examples of academic vocabulary from Coxhead’s (2000:232) academic word list (AWL) include *chemical*, *emphasis*, *proceed* and *sustain*.

The videos used in the current study contain more technical terms which are expressed in Latin. These terms are used as academic vocabulary items, but they are not accounted for by Coxhead and Nation. Coxhead's AWL is intentionally broad and general. Other, more specific, word lists include Latin terms as academic vocabulary since they pertain to the medical field, which relies on Graeco-Latin terminology for its academic vocabulary and, by extension, its subject-specific terms. Therefore, for the purposes of this study, these terms need to be addressed by extending Coxhead and Nation's definition of "academic vocabulary" (Coxhead & Nation, 2001:253). Examples of academic vocabulary from the videos used in this study include Latin terms (e.g. *vena cava*, *cavum oris*) and terms which students would not encounter in everyday English (e.g. *palpate*, *palmar*).

4.2.3 The principles of subtitling

To create subtitles for the videos used in the present study, subtitling conventions as set out by Karamitroglou (1997:1) were used. These conventions, discussed in more detail in Section 3, include how many line numbers are allowed on-screen, where the subtitles are positioned on-screen, how many characters and words are allowed per line, fonts, and how long a particular subtitle remains visible on-screen (Kramitroglou, 1997:2).

4.2.4 The principles of plain English and their application to academic subtitling

This study considers the contrast between plain English and academic English subtitles based on the number of differences between them, including the criterion that there should be fewer scientific terms in plain English. As a result of these differences, editing plain English subtitles requires a different approach to that of editing academic English subtitles. Cutts (2020:xix) presents guidelines for writing in plain English, arguing that "... [p]lain English is not an absolute: what is plain to an audience of scientists...may be obscure to everyone else" (2020:xix). This notion was taken into consideration when creating the plain English subtitles for the videos used in this study.

A select few of the major principles of plain English writing were considered when formulating the revised plain English subtitles for this study as they pertained to the subtitling process and its conventions. These plain English principles include concision (shortening sentences where

possible), giving preference to plain English words over scientific terms and converting sentences (whether written or spoken) from passive voice to active voice (Cutts, 2020:xxiv).

4.3 Methodology

As mentioned in the introduction to this article, the subtitles for this study were created based on videos used by students in an animal anatomy module. These subtitles and the resulting word lists encompass two of Coxhead and Nation's categories (2001:252), as they are both academic and subject-specific.

The videos in the animal anatomy module were created to replace the anatomy classes during the COVID-19 pandemic, making them a valuable resource. The videos were originally created because students could not dissect a fresh animal cadaver during each anatomy class, as this was impractical.

The students of this module also acted as the participants of the study. The students were largely NESB learners. In a questionnaire used as part of a larger study linked to the present study, participants were asked to specify their mother tongue (L1). In response, 52,33% said Afrikaans was their mother tongue, 33,72% identified English as their L1, 5,81% stated Sepedi was their L1, 2,33% said Sesotho, 2,33% Xitsonga, 1,16% isiXhosa, 1,16% Setswana, and 1,16% stated "Other" as their L1. As a result, the participants' mother tongues were unevenly distributed.

Considering the participants' language backgrounds, guidelines were taken into consideration when compiling the subtitles and the subsequent word lists. As the academic English subtitles were transcribed verbatim, very few edits were introduced. These subtitles followed the general subtitling standardisation guidelines as set out by Karamitroglou (1997:1). These principles include the subtitles' position on the screen, limiting the number of subtitle lines on-screen, adhering to a limit of 35 characters per line, and adjusting the duration of subtitles based on the word count of each line (Karamitroglou, 1997:2-3).

Conversely, the plain English subtitles required changes on two levels: firstly, the subtitles had to adhere to Karamitroglou's subtitling conventions. Secondly, the subtitles needed to follow plain English guidelines, and were often changed to fit these guidelines (Cutts, 2020:xxiv). The principles for plain English as set out by Cutts (2020:xxiv-xxv) were followed selectively, depending on their relevance and applicability to subtitles as a "genre" of text.

The first general principle of plain English adopted from Cutts (2020:xxv) is the use of short sentences. Due to their momentary nature, subtitles gravitate toward this principle. Karamitroglou (1997:2) suggests that subtitles should not exceed two lines, with up to 35 characters per line and a maximum duration of approximately three seconds. Cutts (2020:22) suggests keeping sentences at a length of approximately 15-20 words, which is often much more than the suggested 35 characters for subtitles. The subtitles used in this study, when transferred to plain English, were therefore often shortened versions of the spoken academic English spoken in the videos. For example, in a video discussing the general plan of the animal body, the presenter says the following (time stamps are included to show how long the subtitle appeared on-screen):

0:14:07–06 - 0:14:11.98: Now we can look inside the joint, and this joint has two compartments.

The above is a verbatim transcription of the words used on-screen. This sentence had to be spread over approximately four seconds, and while it contains 13 words, which adheres to Cutts' guidelines, the sentence consists of 70 characters. As a result, to adhere to subtitling conventions and plain English conventions, this subtitle required editing. The plain English version of the subtitle was therefore changed in the following way (note the symbol $\backslash n$ denotes a new line of text):

0:14:07.05-0:14:10.48: Look inside the joint now. $\backslash n$ It has two compartments.

For the edited, plain English subtitle, the sentence was shortened to adhere to subtitling conventions. Firstly, the subtitle is now spread over approximately three seconds, in accordance with Karamitroglou's guidelines (1997:2). The sentence is also split over two lines, and into two separate sentences. Both sentences combined now only contain nine words, with 27 characters in the first line and 24 characters in the second line – well within the 35 character per line limit.

The next principle adopted from Cutts (2020:154) involved the preferential use of English terms over scientific terms in other languages. In some cases, as shown in the plain English word list and explained in the methodology section below, some of the non-English scientific terms used in the videos remain unchanged in the plain English subtitles. This is generally because these terms are either already well-known, or their meaning may change when translated. Cutts (2020:154) asserts that unless an author is aware of their audience's skill level in a subject, it is best to avoid non-English words altogether. For the purposes of this study, a

specific animal anatomy module’s videos were used, and therefore the viewers of these videos were considered to have the appropriate knowledge to deal with non-English scientific terms. Where appropriate, however, some Latin and Greek terms were translated if a more widely-used English translation was available. For example, in a video about the animal’s gastrointestinal tract, the presenter notes:

0:00:24–82 - 0:00:30.54: and then the *cavum oris* proper, that is the proper cavity between the teeth and the tongue.

When the plain English subtitles were created, this sentence was once again split over two lines. Its length of 91 characters was also shortened. In addition, some of the anatomical terms in the sentence were changed:

0:00:24–82 - 0:00:30.54: and then the oral space, /n the space between the teeth and tongue.

Having been split into two lines, the first line now contains 23 characters, while the second contains 39 characters. Although the second line is slightly longer than Karamitroglou’s recommended 35 characters, it is nevertheless shorter than the original 59 characters, and the meaning of the sentence has been retained. Cutts’ guideline about non-English terms has been applied in this instance. In the case of the term “oral”, the word remains unchanged. This is because it is anticipated that students in an animal anatomy module at tertiary level would understand this term. However, the term “cavity”, while also a relatively common scientific term, does have a widely-recognised, simpler English counterpart (“space”). Therefore, in adherence to plain English guidelines, “space” was used instead. In this sense, the Latin term “*cavum oris*” is changed to read as “oral space” in its simple English iteration.

Lastly, the subtitles incorporated Cutts’ (2020:68) principle of changing passive voice statements into active voice, where applicable. Cutts (2020:68) argues that active voice writing is more personal and less obscure, although he does not advocate for doing away with passive voice altogether. Consequently, some subtitles which were in the passive voice in their academic English versions remained unchanged in their plain English versions. The most prominent reason for this decision is based on Cutts’ recommendations that the passive voice can “... focus attention on the receiver of the action by putting it first [or it can] help in positioning old or known information at the start of a sentence or clause, and new information at the end” (2020:77). For instance, the use of the passive voice in the following subtitle remains unchanged as the focus is on the object rather than the subject of the sentence:

0:00:55–.46 - 0:00:58.50: On this side of the animal, \n half of the skull has been removed.

The passive voice has been retained in this plain English subtitle to place the focus on the animal’s skull, and not on the lecturer making the statement. However, in cases where the students perform a specific action, the subtitles are written in the active voice. In this example, the original subtitle in the passive voice reads as follows:

0:03:17–.44 - 0:03:20.62: Each of them ends in a Fallopian tube, which can be seen like this...

This sentence focuses on the students, who need to see the anatomical process for later recall. On-screen, the presenter is also pointing to the part of the anatomy (the uterine horn), showing it to the camera. Therefore, the plain English subtitle has been changed to the active voice to reflect this:

0:03:17–.44 - 0:03:20.62: They each end in a Fallopian tube, \n which you can see looks like this...

4.3.1 Presentation of subtitles to study participants

When presenting subtitled study materials to participants in the study, a preparatory instructional video was made available for the participants to watch. Under the guidance of the lecturer of the module in question, the participants were instructed to watch the preparatory video first, to ensure they knew which subtitles were available and how to activate them.

Each video has three sets of subtitles: academic register, plain English and keywords. The academic English subtitles were a verbatim transcription of what is said in the videos, including the discipline-specific terminology, while the plain English subtitles aimed to “translate” the academic English text into simple English terms. The verbatim academic English subtitles follow the abovementioned subtitling guidelines as set out by Karamitroglou (1997:2). For example:

0:04:54–02 - 0:05:01.86: Air then goes down over the epiglottis, \n straight into the trachea to come out there.

The plain English subtitles follow the abovementioned guidelines as set out by Cutts (2020:xxiv-xxv). For example:

0:04:54–02 - 0:05:01.86: Air goes over the epiglottis, \n into the windpipe and comes out there.

The keyword subtitles contain certain important terms selected by the module’s lecturer based on their frequency, their role in the students’ understanding of certain concepts explained in the videos, and the students’ likelihood of encountering these terms in practice. For example:

0:04:54–02 - 0:04:56.84: Epiglottis

0:04:56–88 - 0:05:01.22: Trachea

The videos’ academic English and plain English subtitles form the basis for the word lists which resulted from the current study. The academic English word list for this study (Appendix B) was created using the program WordSmith Tools version 5.0 (Lexical Analysis Software Ltd, 2022:n.p.). Concordance tools such as WordSmith Tools are already linked to established corpora and word lists, which aid in the identification of words according to frequency lists: the most frequently occurring 1000 words, then those in the 2000 and 3000 most frequently occurring word lists, as well as in the AWL, as identified by Coxhead (2000:232). However, the specificity of the phrases used in this research makes it more advantageous to employ the Medical Academic Word List (MAWL) (Wang, Liang and Ge, 2008:442), the Medical Academic Vocabulary List (MAVL) (Lei & Liu, 2016:42) and, in some cases, the Chemistry Academic Word List (CAWL) (Valipouri and Nassaji, 2013:248) instead of the AWL. In addition, since the terminology which forms the focus of this study comes from the field of animal anatomy, a veterinary word list such as the Veterinary Nursing Medical Chart Corpus (VNMC) (Ohashi, Katagiri and Oka, 2018:312) has been deemed as a useful point of comparison.

Word lists are vital in differentiating plain English from academic English. If words in the plain English subtitles can be limited to those in the first 1000-, 2000- and 3000-word lists, it seems intuitive that the simpler the plain English is kept, the more accurate the results may be in identifying the effects of plain and academic English subtitles. It must be noted that the academic English can only be simplified to a limited extent if it is still to convey the intended meaning. Additionally, as noted earlier in this paper, the academic subtitles in this study are “academic” in the sense that they contain various technical and subject-specific terms, and not because they contain a high frequency of specific “academic” words. The word lists which resulted from this study provide a means of comparing the original academic subtitles used in the videos and their plain English counterparts.

4.3.2 The development of a word frequency list based on academic English subtitles

To create a word frequency list based on the academic English subtitles used in this study, certain criteria needed to be followed. Firstly, the keyword subtitles provided by the module lecturer from the course material/videos were used as input for WordSmith Tools version 5.0 (Lexical Analysis Software Ltd, 2022:n.p.). These keywords consisted of significant terms deemed important by the relevant lecturer on the basis that the keyword subtitles contained only the most important words required by students for the module. Secondly, the keyword subtitles excluded proper nouns, which are deemed “...less important for language learners” (Ashrafzadeh, 2021:251).

The academic English subtitle word list is based on subtitles which were created for a set of 12 videos pertaining to animal anatomy. The frequency of these words, as determined by WordSmith Tools, is therefore based on the occurrence of the words within the subtitles. Some phrases which contain two words were separated by WordSmith Tools. Examples include terms such as *vena cava* and *hiatus aorticus*. These words were left separate in these cases, as these words are not always used together (for example, *hiatus* is sometimes used together with ‘oesophagus’). Below is a list of the 20 most frequently occurring words.

Table 1: The 20 most frequently occurring words in academic English subtitles used in 12 animal anatomy videos:

Word	Freq.	%	Videos
NERVE	40	1,767	4
LYMPH	38	1,678	3
CAVITY	33	1,458	5
CRANIAL	32	1,413	5
NODE	29	1,281	2
CAUDAL	28	1,237	8
CAVA	65	1,104	4
VENA	25	1,104	4

ARTERY	22	0,972	4
REGION	22	0,972	5
MUSCLE	21	0,928	5
PENIS	21	0,928	1
JOINT	19	0,839	3
AORTA	18	0,795	3
ENDOCRINE	17	0,751	1
SPINAL	17	0,751	2
NERVES	15	0,663	2
PLEURAL	15	0,663	2
SYSTEM	15	0,663	5
CAUDALIS	14	0,618	4

Based on the information in Table 1, the list of frequently occurring academic words in the animal anatomy field are far removed from the most frequently occurring words in the AWL (Coxhead, 2000:213). Whereas the most frequently occurring words in the AWL are more general words such as *identify*, *distribute* and *analyse* (Coxhead, 2000:232-233), the frequent words in the videos used in this study are much more specific due to their technical and specialised nature (e.g., *cranial*, *aorta*, *endocrine*). This is in line with the notion that word lists which consider a variety of words in a specific field will produce lists which are most useful to that field (Cooper, 2000:18; Nation, 1990:105). Due to their specialised nature, 178 (29%) of the words on the list in Appendix B were adjusted for the plain English subtitles where appropriate.

4.4 Findings and discussion

While subtitling has become an essential tool in the film and television industry, allowing audiences from diverse backgrounds and cultures to access content in a language they

understand, it has not yet been used to its full potential in academic contexts. Academic subtitling often uses complex language and technical terminology depending on the discipline involved, which can pose a challenge for viewers. This is where the use of plain English conventions in subtitling comes into play. Plain English conventions aim to simplify language and make it more accessible to a wider audience. This section aims to discuss the results of this investigation into the impact of plain English conventions through the creation of a word frequency list. These findings provide insights into the benefits of plain English conventions in subtitling and their potential to improve the accessibility and effectiveness of educational videos when used in conjunction with a wordlist that serves to clarify scientific and technical terms.

Table 1 indicates the 20 most frequently occurring words from the academic subtitles used in this study. As is shown in the table, the most frequently occurring word was *nerve* (40 occurrences), which does not occur in the AWL (Coxhead, 2000:213), as the AWL does not include technical or subject-specific terms. In fact, of the 20 most frequently occurring words, none appear in the AWL. For some of these words (e.g. *artery*, *pleural*, *caudal*), it can be argued that they are too discipline-specific to appear in the AWL. For words such as e.g. *system*, *region* and *muscle*, this explanation is insufficient, since they are considered more common words. When compared to Coxhead's AWL (2000:213), there is only a 2% overlap between the AWL and the academic English subtitle word list. This is likely because the word list based on the subtitles contains largely Latin and Greek terms, and these terms are specific to the field of animal anatomy. As mentioned previously, due to the specificity of the terms used in this study, it was deemed better to instead rely more on the MAWL (Wang, Liang and Ge, 2008:442), the MAVL (Lei and Liu, 2016:42) and the CAWL (Valipouri and Nassaji, 2013:248). Since the terms used in this study focus on the field of animal anatomy, the VNMC (Ohashi et. al., 2018:312) has also been used.

The MAWL was developed using a corpus of 1.09 million words from medical research articles and, like the AWL, the MAWL was formulated by excluding words from the General Service List (GSL) (Wang, Liang and Ge, 2008:443). Of the 615 words in Appendix B, 49 words (8%) also appear in the MAWL. This makes the MAWL a more reliable point of comparison than the AWL, in the case of this study. Words from Appendix B which also occur in the MAWL include *abdomen*, *area*, *cell*, *circulation*, *diffuse*, *external*, *fluid*, *gland*, *internal* and *membrane*. These terms, while technical, do not cover the broader scope of terms available in Appendix B, and are not necessarily the most important terms students would need to be familiar with.

This necessitates the comparison of Appendix B to a different word list. For this reason, the MAVL was chosen, as it is a more updated version of the MAWL (Lei and Liu, 2016:43).

Unlike the MAWL, the MAVL was developed using both medical English textbooks and medical English articles. The MAVL also accounts for all English words, unlike the MAWL (Lei and Liu, 2016:43). When comparing the word list in Appendix B to the MAVL, there is an overlap of 62 words (10%). Words which overlap between Appendix B and the MAVL include *arterial*, *distal*, *hormones*, *lateral*, *pulmonary*, *respiratory*, *tissue*, and *ventricular*. While some of these words are more specialised, Latin terms are not included since both the MAWL and the MAVL only consider words in English.

Similar to the MAWL and the MAVL, the CAWL also considers English words only, and excludes abbreviations (e.g. CO₂) and words that were considered “too technical” such as *aldehyde* or *hydroxyl* (Valipouri and Nassaji, 2013:248). There is an overlap of 73 words (12%) between Appendix B and the CAWL – the highest overlap percentage between the three abovementioned word lists. The words which overlap are not necessarily subject-specific words. Overlapping words include e.g. *chain*, *extend*, *fact* and *shoulder*. These comparisons show that the MAWL, MAVL and CAWL include a wider variety of terms, making them useful points of reference for future word lists in similar disciplines. However, the lack of animal-specific terms still excluded many terms from Appendix B when preparing comparisons with the above lists. Therefore, the VNMC (Ohashi et. al., 2018) has also been consulted.

The VNMC was developed due to a perceived need for specialised corpora and consists of data gathered from medical charts and information recorded by veterinary nurses (Ohashi et. al., 2018:312). In terms of comparing Appendix B to the VNMC, it is important to note that the VNMC consists of distinct “categories”, namely canine terms, feline terms and a list of combined canine and feline terms (Ohashi et. al., 2018:313). This has proven to be a limitation to this list since the subject-specific videos focused largely on the ovine body. Partly because of this exclusionary factor, there is an overlap of only 8 words (1%) between Appendix B and the canine VNMC list, which included words such as *caudal*, *salivary* and *thoracic*. Between Appendix B and the feline VNMC list, there was an overlap of only two words (0,3%) – *fat* and *pancreas*. Along with the difference in terminology between canine, feline and ovine subjects, the VNMC also focuses on medical reports, not necessarily journal articles (as is the focus of the MAWL, MAVL and CAWL). This could also be a contributing factor as to why

the overlap between Appendix B and the VNMC is so low. Another contributing factor is once again the broad use of Latin terms in the videos which were watched during this study.

4.4.1 The importance of word list comparisons to the compilation of plain English subtitles

The creation of the word list presented in Appendix B and its comparison to the MAWL, MAVL, CAWL and VNMC, has been instrumental in compiling the plain English subtitles used in this study. By comparing various frequently used words from different disciplines, it gave a clearer indication of which technical words needed to be simplified to best benefit students.

Academic word lists are important for subtitles, as they contain high-frequency words used in academic and professional contexts. They simplify the process of using the right language and terminology for the topic, and help viewers understand the specialised terms used in their area of study.

4.4.2 The advantages of word lists for students

When students learn and use frequently used words, they can better understand academic texts and lectures (Ha, 2021:4). These words often have specific meanings within academic contexts and understanding them can help students make sense of the ideas being presented. The greater range of vocabulary students have (of both general and academic words), the better their chances at understanding the broader text. The reason for this is that a wide range of vocabulary reduces the likely number of unknown words encountered, and therefore increases the chances of interpreting new words from context (Ha, 2021:4). One of the principles of plain English is that more high frequency words should be used as these are generally more familiar than low frequency words that, by definition, are found to occur less, and so not as widely distributed in texts (Blamires, 2000:13). Therefore, if academic words are changed to plain English phrasing using high frequency vocabulary, students who are able to understand and use such high frequency words will then have fewer problems understanding academic texts and lectures.

Employing frequently used academic words can help students enhance their writing skills by making their work more precise, clear, and concise. These words can also help students write

more cohesively (Choo, Lin, Singh & Ganapathy, 2017:56). Frequently used academic words often also have specific connotations, which can be important when communicating complex ideas (Ohashi et. al., 2018:313). By using these words, students can communicate their ideas clearly (Choo et. al., 2017:56). Understanding and using frequently used academic words is essential for success in academic settings.

4.4.3 The advantages of subtitles for NAS students

In terms of academic literacy, subtitles can be beneficial for teaching and learning in NAS. They offer a further level of support for students, promote language development, clarify technical terms, and introduce students to specialised terminology in context (Van Der Zee, Admiraal, Paas, Saab & Giesbers, 2017:3). Students may develop a wider disciplinary vocabulary as a result. Subtitles are a valuable tool for academic literacy, enabling more effective and inclusive student engagement with and understanding of scientific concepts.

4.5 Conclusion

The development of parallel word lists using subtitled videos offers a valuable tool for students, researchers, and educators to enhance vocabulary acquisition and linguistic analysis. The predominance of subject-specific terms in animal anatomy makes it difficult to compare a word list based on the subtitles created for this study to a more generalised academic word list such as the AWL (Coxhead, 2000:213). The development of a parallel word list in plain English can prove useful to students as they negotiate a discipline filled with subject-specific terminology, and a corpus-based approach to these word lists has proven instrumental in their development. Plain English subtitles should be adjusted to adhere to both sets of conventions to produce clearer, more comprehensible subtitles. This paper has discussed the process of creating and comparing academic and plain English word lists for subtitles in the natural sciences, and highlights areas for future study.

Audience comprehension and engagement with content are improved by plain English norms in subtitling. The use of short sentences and the avoidance of jargon are just a few examples of basic English rules that help to simplify language and make it more approachable. To increase the content's usability, subtitles should consider plain English conventions.

Chapter 5: Language and accessibility: How South African universities are using technology for language accessibility in higher education

Abstract

In 2020 the Department of Higher Education and Training (DHET) published a new language policy framework to encourage multilingualism in higher education as an amendment to the Higher Education Act of 1997. The policy states that all South African students have equal access to education regardless of their home language. The DHET urges institutions to employ technology to improve language access to accomplish this. Following the DHET's new language policy, this study will examine how South African universities promote language accessibility in higher education by leveraging technology and their policies. Creating an inclusive and accessible learning environment is a challenge most South African universities face. Post 1994, universities in South Africa introduced language policies that reflect a broader understanding of the benefits of diversity and inclusivity. This article examines the relationship between language legislation, its implementation through policy and related technological advancements that improve accessibility in higher education. Commencing with a discussion on language accessibility in higher education and the connection between language laws and technology breakthroughs, the article emphasises the importance of language in fostering an inclusive atmosphere that fosters technological innovation. The article also explores the relationship between internal language policies and current technological developments in higher education related to language accessibility. The paper concludes by discussing these advancements' potential disadvantages and advantages in improving language accessibility.

Keywords: Department of Higher Education and Training, language accessibility, language policy, multilingualism, technology.

5.1 Introduction

In 2020, the Department of Higher Education and Training (DHET) released a new language policy framework to promote multilingualism in higher education as an amendment to the Higher Education Act of 1997. The policy ensures that all South African students have equal access to education regardless of their home language (HL). To achieve this, the DHET encourages universities to use technology to enhance language accessibility (2020:17). This paper will explore how South African universities use technology and policies to promote language accessibility in higher education in line with the DHET's new language policy. This article focuses on language policy in the period after 1997, specifically 2017–2023. The reason for this focus is because a revised language policy was released in draft form by the DHET in 2017 (DHET, 2018:2). The revised policy framework was then published in 2020, where it was announced that the policy framework would take effect in 2022 (DHET, 2020:18).

5.1.1 Problem statement

A universal problem faced by modern universities is the establishment of an inclusive and accessible learning environment. Students whose HL is not the language used as the medium of instruction (MOI) at university confront significant obstacles to participation in higher education. Amidst efforts to promote multilingualism, challenges with language teaching remain. Language policies are essential in fostering an atmosphere that values diversity, supports inclusive behaviour, and promotes technical advancement for accessibility. These are challenges faced by universities where students come from a wide range of linguistic backgrounds, of which South African universities are a prime example. As a result, this paper investigates how language policies and related initiatives at various South African universities might encourage technological advancements that promote accessibility for all students in higher education.

Universities in South Africa have implemented language policies that reflect a deeper understanding of the value of diversity and inclusiveness as higher education has progressed over the past 20 years. This has been done in response to and fulfilling the new Language Policy Framework for Public Higher Education Institutions issued by the DHET, effective 1 January 2022 (DHET, 2020:18). These regulations are designed to provide an accepting environment for all students, regardless of their language proficiency (DHET, 2020:16). At the same time, new tools and resources that assist students in overcoming learning obstacles have been made possible because of technological breakthroughs.

5.1.2 Background

The political and social developments of South Africa have a complex relationship with the nation's history of language teaching. The troublesome history of language education in South Africa is well-documented by authors such as Alexander (1989:40), Van Rensburg (1999:81), Webb (2002:166), Heugh (2007:356), Bam, Ntsebeza and Zinn (2018:35) and Makalela (2022:149).

South Africa was home to various indigenous languages spoken by numerous groups before European colonialism. Local communities were the main settings for language teaching, where children learnt their mother tongue and the customs accompanying it (Bam, Ntsebeza & Zinn, 2018:8). The arrival of European settlers brought about significant changes in language teaching. The Dutch East India Company initially spoke Dutch, which later developed into Afrikaans. Through the establishment of schools and the teaching of English, missionaries contributed to education as well. However, this meant that Bantu languages were codified and classified through Western systems (Makalela, 2022:149).

Once British influence in South Africa increased, English-medium schools were established. While Afrikaans remained the primary language of the Afrikaner community, English replaced it as the language of business and government. During this time, indigenous languages were largely marginalised (Bam, Van Sitters & Ndlovu, 2018:155).

A system of racial segregation and discrimination was instituted during the apartheid government, which lasted from 1948 to 1994. Social divisions were enforced using language policies. The Bantu Education Act of 1953 required black African students to be educated in their mother tongues until grade 4 before switching to English or Afrikaans, further devaluing indigenous languages. In this instance, the MOI in schools was used as a form of oppression. This was counteracted by movements such as the 1976 Soweto uprising, where students protested the use of Afrikaans in the school curriculum (Van Rensburg, 1999:82).

After apartheid was abolished and a democratic government was put in place in 1994, South Africa changed significantly in many areas, including education. The new Constitution offered equal status to 11 official languages, including English, Afrikaans, and various indigenous languages (Mzangwa, 2019:7).

The Language-in-Education Policy (LiEP), implemented in 1997, has as its goals the promotion of multilingualism and fair access to education. It describes a hierarchy of

languages, with students learning their mother tongue for the first three years of school before introducing other languages more gradually (DBE, 1997:2). English is then usually introduced as the language of learning and teaching from grade 4 onward (a process known as additive bilingualism).

Despite initiatives to encourage multilingualism, difficulties in language education persist. Due to resource shortages and a shortage of skilled teachers, many schools and universities struggle to offer high-quality instruction in various languages. There are ongoing conversations concerning language policies and practices and discussions over using Afrikaans in education, the dominance of English, and the preservation and intellectualisation of indigenous languages. South Africa's history of language education reveals the delicate interplay between colonial legacies, political ideologies, and the goals for inclusivity and multilingualism in a diverse society.

5.1.3 The national drift towards English monolingualism in higher education

English is increasingly becoming the language of choice in various fields, including government, business, media, and education. South Africa has recently experienced a national drift towards English monolingualism, especially in higher education, contrary to the spirit of multilingualism (Anstey, 2022:n. p.). This trend can be linked to several factors, including sociocultural influences, economic opportunities, historical legacies, limited resources, and the view of English as a lingua franca.

Despite the goals and ideals of the LiEP, there is a debate that these ideals are not achieved in practice (Coetzee-Van Rooy, 2018:20). This could be due to either the failure to confront the linguistic effects of colonisation and apartheid, the influence of English that prevents the growth of African languages in higher education (Coetzee-Van Rooy, 2018:21), or aspects of language policies in higher education that are not enacted.

There are issues and concerns with the drift to English monolingualism in South African higher education. It prompts questions about the marginalisation and neglect of indigenous languages, which are crucial for social unity, cultural preservation, and identity. The overemphasis on English strengthens existing power imbalances and perpetuates linguistic inequalities, especially for those who are not fluent in English (Coetzee-Van Rooy 2018:21).

5.1.4 #AfrikaansMustFall and other reactions to language policies in South African higher education

In response to language inequalities in higher education, several movements developed at South African universities in reaction to language policies at these institutions. On 20 August 2015, a documentary titled *Luister (Listen)* was released, which aimed to highlight racial inequity and discrimination at Stellenbosch University (SU) (Corder, 2015: n.p.). The documentary also sheds light on issues of language inequality at SU and how students saw Afrikaans as an MOI as a significant academic barrier (Dube, 2017:15).

As universities began to review their internal language policies formally, students and the public's reactions varied based on their interests and backgrounds. The #AfrikaansMustFall movement was a student-led protest movement that emerged in South Africa in conjunction with the #FeesMustFall movement (Dube, 2017:18). The campaign primarily focused on advocating for language reform in higher education. The movement gained significant traction and led to widespread protests and discussions about the MOI at South African universities and the transformation of the higher education system in South Africa. However, university language policies were also contested by pro-Afrikaans groups, which led to several court cases which delivered different verdicts.

In the case of *AfriForum and Another v Chairperson of the Council of the University of Pretoria and Others* (2016: n.p.), the then-current UP language policy was disputed by AfriForum and Solidariteit. After hearing the case, the Gauteng High Court rejected AfriForum's appeal. The court determined that the institution had the right to choose its language of instruction in accordance with its educational goals and that UP's language policy was not unconstitutional.

The University of South Africa (UNISA) implements a language policy that aims to promote multilingualism and inclusivity while also acknowledging the dominant role of English in academic discourse (UNISA, 2016:3). Its policy states that all study material and assessments are to be offered solely in English, however the policy does add that support activities can be offered in the students' language, where feasible (UNISA, 2016:4). However, the 2016 language policy is currently under review in order to align with the DHET's updated language policy framework (Mphaphuli, 2022: n.p.). This is an especially important step considering the university's involvement in the case of *Chairperson of the Council of the University of South Africa and Others v AfriForum NPC* (2021: n.p.). AfriForum challenged UNISA's policy, arguing that it did not adequately accommodate Afrikaans-speaking students and violated their

rights to education and language. The court held that UNISA's 2016 English-only policy violated section 29(2) of the Constitution, but the court added that appropriate time had to be given for changes to the policy to be implemented.

For similar reasons, AfriForum would contest against the University of the Free State (UFS) in 2017. In the case of *AfriForum and Another v University of the Free State* (2017:n.p.), the UFS had proposed a new language policy that sought to make English the primary language of instruction while supporting students who wished to be taught in Afrikaans, among other languages. According to AfriForum, Afrikaans-speaking students would be unfairly singled out by the new language policy, impacting their right to be educated in their mother tongue. The High Court of South Africa rejected AfriForum's objection. According to the court, the UFS's language policy was not illegal because it was developed to support inclusion, access to education, and the university's academic objectives.

In the case of *Gelyke Kanse and Others v Chairperson of the Senate, Chairperson of the Council and the University of Stellenbosch* (2019:n.p.), a pro-Afrikaans education association called *Gelyke Kanse* (Equal Chances) filed a case against SU to oppose its 2016 language policy. The organisation went to the High Court seeking an order to examine and reject the 2016 SU language policy and restore the 2014 policy. The High Court dismissed this application and held that the 2014 policy was not inclusive of non-Afrikaans-speaking students. In this case, the appeal filed by the applicants was also dismissed.

5.1.5 Exceptions

During these language policy updates at South African universities, different universities adopted different approaches to language policy updates based on their unique circumstances, student demographics, and historical factors. As mentioned above, some universities changed their language policies significantly, while others made more incremental adjustments.

An example of an institution that made more incremental language policy changes is the University of KwaZulu-Natal (UKZN), formed due to a merger between the University of Natal and the University of Durban-Westville (UKZN, n.d.:n.p.). The University of Durban-Westville had a dual-medium policy with English and isiZulu as the languages of teaching, but the University of Natal maintained a largely English-medium instruction strategy. Creating a

language policy that considered the linguistic diversity of its students and the post-apartheid educational environment was one of the issues UKZN faced after the merger (Mkhize & Balfour, 2017:140).

After several reviews throughout the university's existence, the UKZN language policy was amended and approved once again in 2019 (Mungroo, 2022: n.p.). The revised policy recognises the value of English as a universal language and keeps the focus on multilingualism. Additionally, it aims to support the growth and use of indigenous languages, particularly isiZulu, in an academic setting (Mungroo, 2022: n.p.). To further focus on multilingualism, UKZN undergraduate students must also complete a compulsory introductory isiZulu module (Naidoo & Gokool, 2020:26). The policy also includes methods for fostering language learning, providing translation services, and supporting students' language needs.

The Cape Peninsula University of Technology (CPUT) has traditionally had an English-medium instruction policy, with English being the primary language of instruction and communication (Somlata, 2018:79). However, in recent years, CPUT has introduced a revised language policy that acknowledges the role of English as the language of international communication and professional discourse. It also recognises the significance of indigenous languages, particularly Afrikaans and isiXhosa, within the local context of the Western Cape province (Somlata, 2018:2). Furthermore, medical students at SU's Tygerberg campus were historically instructed primarily in Afrikaans (Stellenbosch University, 2009:1). However, the university has been shifting toward a bilingual model in recent years, with Afrikaans and English as the official language of instruction. The necessity to accommodate students from various language backgrounds and the changing demographics of the student body led to the beginning of the language transition process. The goal of SU has been to provide students who are more skilled in English with fair access to medical education in recognition of the significance of English as a universal language (Stellenbosch University, 2018:6). At present, the policy for students at SU's Tygerberg campus is that the MOI during ward rounds is decided by the class's composition (Stellenbosch University, 2018:6).

5.1.6 Growing interest in translanguaging for pedagogical empowerment

In South African universities, interest in translanguaging, a pedagogical strategy that promotes the seamless and intentional use of multiple languages in educational contexts, is growing. In the South African higher education context, this section examines the growing interest in

translanguaging to promote pedagogical empowerment (Hurst & Mona, 2017:138). It explores how this strategy considers the linguistic diversity of the student population, supports inclusive education and improves student engagement and learning outcomes (Hurst & Mona, 2017:144).

With 11 official languages, South Africa has a diverse linguistic environment and faces difficulties in higher education. The use of English or Afrikaans as the primary language of instruction has historically been favoured by language laws, potentially marginalising pupils whose first language is not one of these dominant languages. The development of knowledge, efficient communication, and student achievement have all been hampered by this linguistic isolation. As a result of their awareness of these difficulties, academics and researchers are now focusing on translanguaging as an effective instructional strategy (Hurst & Mona, 2017:145).

In educational contexts, translanguaging embraces the flexible and dynamic use of several languages while challenging the idea of strict language division. It encourages students to use their linguistic frameworks, including their mother tongues, to interact meaningfully with academic material and communicate their understanding (Hurst & Mona, 2017:141). Translanguaging enhances students' active engagement, critical thinking, and linguistic agency by crossing the lines between languages (Motlhaka & Makalela, 2016:257).

By allowing students to use their language resources to improve their learning, translanguaging provides a road to pedagogical empowerment. Instructors may build inclusive learning environments that recognise and support students' linguistic identities by affirming and supporting diverse language practises (Motlhaka & Makalela, 2016:257). This method allows students to engage in deep learning, speak confidently, and cross-linguistic and cultural barriers (Motlhaka & Makalela, 2016:258).

The increased interest in translanguaging for educational empowerment reflects a change in South African universities toward accepting and respecting linguistic diversity. This method effectively addresses the problems with historical languages, promotes inclusive education, and improves student involvement and academic results (Hurst & Mona, 2017:141). To fully utilise the pedagogical potential of translanguaging and encourage equal access to education for all students, additional research and collaborative efforts are required as South African universities continue to investigate and adopt translanguaging approaches.

5.1.7 The 2017/2020 DHET language policy

Some have interpreted the DHET's proposed language strategy as a criticism of higher education for its inadequate multilingualism advancement. The policy has spurred discussions and arguments over the degree to which language policies in South African universities genuinely support and reflect the country's linguistic diversity (Erasmus, 2019:iii).

Since English is prioritised as the primary language of instruction and communication, critics contend that the approach falls short of fostering multilingualism. They argue that the approach promotes linguistic inequality and the historical marginalisation of indigenous languages by predominately using English (Erasmus, 2019:128). This strategy is a missed opportunity to properly embrace and encourage South Africa's rich language history.

An inclusive and fair learning environment should be the goal of a complete language policy, according to the DHET's policy (Erasmus, 2019:128). This involves supporting the development of multilingualism, allowing for bilingual or multilingual instruction, and giving resources and assistance for indigenous languages. The draft policy also voices the need to promote the intellectualisation² of indigenous languages in South Africa (Erasmus, 2019:148).

5.1.8 The DHET language policy in conjunction with technological developments in South African universities

In recent years, technology has played a crucial role in promoting language accessibility in higher education (Letsoalo, Mabaso & Gouws, 2022:1). Universities in South Africa have used various forms of technology to promote multilingualism, including large language models (LLMs), e-learning platforms, language translation software, subtitling, and online dictionaries and glossaries. This has been done in line with the amended DHET language policy, as English is generally the language favoured by South African higher education institutions, to the disadvantage of those students who do not speak English as their HL (Drummond, 2016:72). This section will first discuss the current higher education language landscape in South Africa and why the need for technological intervention in this area has arisen. In addition, the following section will also provide an overview of previous studies on the use of technology

² The term 'intellectualisation' is not an uncontested concept, due to varying perspectives on the implications, intentions, and potential consequences of intellectualising indigenous languages, with concerns raised about potential homogenisation, appropriation, and dilution of cultural heritage (Turner, 2023:3).

for language accessibility in higher education in South Africa in the form of simultaneous interpretation.

The Constitution initially viewed multilingualism as mandatory in educational institutions and other government contexts (Olivier, 2011:234). However, this was replaced by a call for using languages other than English in the classroom as universities adopted English as their MOI (Antia, 2015:576; Benson, 2018:220; Hungwe, 2019:2). In addition, the DHET's new language policy emphasises that universities must be language inclusive and that over the previous 20 years, little has been done in this area (DHET, 2020:5).

However, as Lacroix (2012:27) notes, it is impossible to assess the advantages of multilingualism without first examining the various factors that necessitate such interventions in the first place. These actions are necessary partly due to South Africans' limited English language proficiency. Cummins (2001:67) defines language proficiency as "...the extent to which an individual has access to and command the oral and written academic registers of schooling". Unfortunately, students frequently lack "access to" and consequently "command of" the verbal and nonverbal academic registers of schooling throughout the foundation phase of the educational system, which contributes to poor levels of English proficiency among South Africans (Cummins, 2001:67).

The secondary and higher education stages are subsequently affected by these low language proficiency levels (in English and other languages), as in South African schools, the learner's HL is typically used until Grade 3, at which point English is introduced (UNICEF, 2016:1). As a result, students who do not speak English as their first language have difficulty adjusting to using it after the foundation phase. In contrast, speakers of English and Afrikaans continue to benefit from education in their HLs, as they did during colonialism and apartheid (Heugh, 2007:356). As a result, if it is not remedied using intervention techniques, this linguistic ability (or lack thereof) may have a negative effect on academic achievement at the tertiary level (Lacroix, 2012:43).

5.1.8.1 LLMs

An LLM is a sophisticated artificial intelligence (AI) system that processes and produces text like a human would write using training data. These models use deep learning techniques to comprehend and produce coherent and contextually appropriate language (Mhlanga, 2023:8).

Large databases of written text, including books, papers, webpages, and other sources of human knowledge, are used to train LLMs. They gain the ability to recognise linguistic structures, relationships, and patterns in the data, allowing them to produce writing that is similar to human language (Mhlanga, 2023:2).

These models can converse, answer questions or prompts, comprehend and produce text in many languages, and perform various natural language processing tasks, including sentiment analysis, summarising, translation, and more (Mhlanga, 2023:6). They can be used for multiple purposes, such as chatbots, virtual assistants, content development, language translation, and research support.

5.1.8.2 OERTB term bank

UP, the University of Cape Town (UCT), and the DHET conceived the idea of the Open Educational Resource Term Bank (OERTB). It sought to create a bilingual, online term bank focusing on South African university students. The programme operated from 2014 to 2017, providing services in various study fields across all 11 of South Africa's official languages (OER Africa, 2022).

The initiative ultimately benefits students as they can access critical subject-specific concepts and terms in their HLs (Taljard, 2018:n.p.). The initiative's key goals included identifying knowledge gaps in specific fields, cultivating English, subject-specific corpora, the "semi-automatic" abstraction of information, and translating terms into South Africa's ten remaining official languages (Taljard, 2018:n.p.; Carstens, 2015:n.p.).

5.2 Methodology

The methodology employed in this study incorporates two key components: the examination of primary documents and a literature review of academic articles. Firstly, the study analyses primary documents, such as publicly available university policies, university websites, and social media sites. The analysis of these primary documents provides direct insight and first-hand evidence, contributing to the reliability and authenticity of the findings. In addition to examining primary documents, the study incorporates a thorough literature review of academic articles.

Literature review, in combination with primary document analysis, provides a thorough and well-rounded investigation. It ensures that the study is informed by both primary sources and existing academic debates, giving the research findings and conclusions a strong foundation. This study seeks to minimise biases, ensure the validity and reliability of the data, and provide a thorough and insightful analysis of the research topic using a dual strategy.

5.2.1 Literature review

In line with the DHET's new language policy, technology in higher education has become an essential method for addressing language accessibility in South African universities. This section provides an overview of the literature on how technology supports students from different language backgrounds at South African universities. This review sheds light on the strategies, difficulties, and potential advantages of utilising technology to improve language accessibility in higher education. This is done by examining current research and scholarly publications. The outcomes of this research add to the continuing conversation about applying language policies and technological improvements in South African universities to foster a sense of empowerment for students.

5.2.1.1 Previous studies on language accessibility in higher education in South Africa: simultaneous translation

Universities in South Africa have long struggled to give students who speak different languages equitable access to education. Before introducing the DHET's new language policy, language accessibility in South African universities was primarily addressed through language policies that varied from institution to institution. The decision that the Minister of Education would be in charge of an institution's language policy was only introduced in 1997 (Olivier & Lotriet, 2007:133). These policies primarily focused on providing translation and interpreting services for students who did not speak the language of instruction well. Nevertheless, despite these initiatives, language barriers remained a significant barrier to many students' full participation in higher education (Mzangwa, 2019:7). Those whose HL was not the language of instruction found it particularly difficult to comprehend lectures, academic texts, and assessment requirements. To address these issues and advance language accessibility in higher education,

the DHET's new language policy has been an important step (Mthombeni & Ogunnubi, 2020:186).

In post-apartheid South Africa, higher education institutions have tested several methods to accommodate students from different linguistic backgrounds. A popular service offered by South African universities has been, and to an extent still is, classroom interpreting services. The UFS, for example, first attempted to provide lectures in Afrikaans and English; however, this proved unfeasible for their staff (Olivier & Lotriet, 2007:134). As a result, simultaneous interpreting in classrooms was offered as a solution. While Olivier and Lotriet (2007:134) agreed that simultaneous interpreting was effective based on the linguistic distribution at UFS at the time, even at this point, there was already some contention as to whether simultaneous interpretation would be feasible at other institutions in the country.

Beukes and Pienaar (2006:130) have pointed out that simultaneous interpretation was not necessarily feasible at an institution such as the University of Johannesburg (UJ) due to the hegemonic nature of English. UJ's formation resulted due to the amalgamation of the Rand Afrikaans University (RAU), the Technikon Witwatersrand (TWR) and the East Rand and Soweto campuses of Vista University in 2005 (Beukes & Pienaar, 2006:129). Due to this merger, the university's student profile changed dramatically as the student body became much more diverse, and therefore simultaneous interpretation was proposed as an alternative to the parallel-medium instruction which had already been taking place (Beukes & Pienaar, 2006:131). The study at UJ conducted by Beukes and Pienaar (2006:131) to determine how to utilise their proposed interpretation plan faced many limitations, including great language diversity in classrooms and students opting to attend classes in English even if they were available in another South African HL such as Afrikaans. Beukes and Pienaar conclude that simultaneous interpretation is not necessarily a feasible alternative to parallel instruction, as the number of students who will benefit will likely be small (2006:137).

A study conducted by Van Rooy (2005:88) at the North-West University's Potchefstroom campus (NWU) found that employing a single medium of instruction is not necessarily more efficient or more cost-effective than using multilingual solutions such as simultaneous interpreting. Again, it should be taken into account that the student population of NWU would differ significantly from other universities in the country as the number of Afrikaans HL students is high (NWU Language Directorate, 2021:22; Van Rooy, 2005:86). Van Rooy's study focuses on modules in pharmacology and engineering at NWU, which were delivered in

Afrikaans at the time (2005:81). Van Rooy concludes that using dedicated interpreters in classrooms is still more cost-effective than parallel classes. In this study, Van Rooy recommends that interpretation be implemented on the Potchefstroom campus of the NWU (2005:88).

Based on these studies, it is clear that simultaneous interpretation did not necessarily benefit students in a metropolitan university, but these services were of use to students in more agricultural areas due to the demographics of these respective areas.

5.2.2 An overview of recent uses of technology and language policy to promote language accessibility at selected South African universities

Higher education institutions have, in recent years, begun to encourage language accessibility, especially in countries with diverse linguistic landscapes like South Africa. Universities in South Africa have embraced digital platforms and new technologies to a greater extent to increase linguistic accessibility and foster inclusive learning environments (Faloye & Ajayi, 2022:1738). This section examines some of the most current technology-based strategies used by South African institutions in conjunction with their institutional language policies to improve language access and meet the educational demands of a diverse student body. These technologies' possible advantages and limitations can be identified by examining these instances, and crucial factors for their successful deployment in enhancing language accessibility can also be considered. UP, the NWU, UFS and CPUT were selected for review as information on their current linguistic technological research is readily available.

5.2.2.1 University of Pretoria

Afrikaans predominated as the language of instruction in South African universities, notably UP, throughout the apartheid era. This was consistent with the government's strategy of favouring Afrikaans while devaluing other languages (Mahlangu, 2019:6).

After apartheid was abolished in 1994, the new government implemented measures to promote multilingualism and address historical inequalities in education. The South African Constitution recognises eleven official languages, and the government has tried to encourage their equitable use and development. UP adopted a new language policy in reaction to these

changes in order to promote multilingualism and guarantee that all students had equal access to higher education (Webb, 2002:172).

UP once again revised its language policy and made other amendments in 2016. The new strategy promotes multilingualism and acknowledges linguistic diversity's value in fostering social cohesiveness and academic performance. Additionally, it emphasises the value of language proficiency for faculty and students and offers assistance with language development. For instance, UP's Language Policy (which took effect on 1 January 2022) recognises that students require academic interventions regarding language and its associated challenges in academic contexts (University of Pretoria, 2021:2).

The language assistance offered to students at UP was initially limited to tutorials, but later technology and its usefulness in this regard were recognised. Assistance has expanded to services such as the Humanities Writing Centre (HWC), which offers in-person and online language consultations with students (Rambiritch & Carstens, 2022:33).

In addition, the use of multilingual subtitling as part of academic videos for specific modules at the university is being investigated (Kruger-Roux & Angu, 2020:63). Subtitling as a technological advancement in promoting language accessibility has shown great promise, and students' reception to subtitles as a technological linguistic intervention has been largely positive (Kruger-Marais & Kruger-Roux, forthcoming).

Furthermore, the digitisation of various texts to create electronic resources for African languages is also underway at UP (Taljard, Prinsloo, & Goosen, 2023:n.p.). This involves, for instance, digitising audio materials and scanning texts (including error correction and text cleaning). This initiative makes electronic resources available in under-represented African languages (Taljard, Prinsloo, & Goosen, 2023:n.p.).

5.2.2.1.1 Implementation at UP

The current UP language policy states that English is the primary MOI at the university (University of Pretoria, 2021:3). In the policy, UP also commits to providing appropriate resources for students to “[draw] on their strongest languages (in particular Sepedi and Afrikaans, but where possible also other South African languages) to assist students in understanding key concepts in their modules” (University of Pretoria, 2021:3).

Some signage on UP's campuses is offered in English, Afrikaans and Sepedi. UP's social media accounts provide postings only in English. The UP website offers the UP logo in English, Sepedi and Afrikaans. Still, the text on the site is exclusively in English, with no apparent translation option. Official documents such as study guides often have institutional rules, plagiarism information, student support and administrative information printed in English, Afrikaans and Sepedi, but this often differs from module to module. Official documents, such as the latest student prospectus, are offered only in English.

5.2.2.2 North-West University

NWU has its main campus in Potchefstroom, in the North-West province. The university has an intricate language policy that has seen a lot of development over time (Maseko & Siziba, 2023:304). The NWU formerly had a large Afrikaans-speaking student body, reflecting the government's linguistic restrictions during the apartheid era. However, the institution adjusted to support multilingualism and address past educational disparities after apartheid ended in 1994 (Maseko & Siziba, 2023:305).

In an effort to support multilingualism and give all students equal access to higher education, the NWU enacted a new language policy in 2002. The policy acknowledged both the right of students to study in the language of their choosing and the obligation of the institution to advance all of South Africa's official languages. Under this policy, the NWU taught English, Afrikaans, and several indigenous languages, including Setswana, isiZulu, and Sesotho. The policy promoted multilingual communication on campus by encouraging language fluency among faculty, staff, and students and using translation and interpreting services (Ngwenya, 2012:233).

However, the NWU significantly changed its language policy in 2016, which sparked debate and drew criticism from students and staff. The new policy called for English to replace Afrikaans as the primary language of instruction while maintaining courses in other languages. This action was taken to increase inclusivity and provide all pupils, even those who did not speak Afrikaans, with access to education. Afrikaans-speaking students and employees, who felt their language and culture were being neglected, opposed the proposed reforms (Gaanakgomo, 2018:n.p.). As a result, the university updated its language policy to allow for more flexibility and allow faculties to choose their own language rules and procedures.

The current language policy of the NWU (approved 22 November 2018) states that “...within the parameters of the principle of functional multilingualism English, Setswana, Sesotho and Afrikaans are employed as official languages of the NWU” (North-West University, 2018:2). As mentioned earlier in this paper, the NWU has been incorporating classroom translation programmes (Van Rooy, 2005:81) to address language accessibility and remain aligned with the 2018 policy.

In addition to simultaneous translation, the NWU has also been focusing on using subtitles as a technological aid for language accessibility (Hefer, 2011:1; Lacroix, 2012:5; Kruger, Hefer & Matthew, 2013:65; Matthew, 2020:2). Hefer’s research mainly focuses on attention allocation and L1 and L2 subtitle reading as determined by eye-tracking measures (2011:8), while Lacroix (2012:1) concentrates on the impacts of same language subtitles (SLS) on comprehension for students in a South African context who speak English as a second language. According to the study, SLS are effective in discipline-specific comprehension, especially if the viewers are trained to use subtitles as a form of academic intervention.

The study by Kruger et al. (2013:65) looks at how subtitles affect viewers’ visual focus. Eye tracking was utilised in the study to map out how participants’ visual attention was split between the images and the on-screen text (subtitles). The authors also consider the cognitive load that could be present in multilingual educational contexts when viewers are required to divide their attention between information sources, particularly if some of these sources are redundant. It was found that subtitled videos did not add to viewers cognitive load (Kruger et al., 2013:65).

Lastly, Matthew (2020:2) investigates how SLS impacts non-native speakers of English in South Africa. This study primarily examines viewers in an online learning environment and discovered that viewing a filmed lecture with additional subtitles had no discernible impact on students’ progress or their perception of cognitive load compared to watching without subtitles (Matthew, 2020:13). The above studies again highlight the technological interventions being developed by South African universities to adhere to both their internal policies and the DHET language policy.

Researchers at NWU have also investigated the effectiveness of the Autshumato Machine Translation Web Service, developed by the Centre for Text Technology (CTexT) at NWU, especially in the context of South African languages (Skosana & Mlambo, 2021:1). This research makes the case that including specialised parallel corpora from various disciplines for

all official languages in South Africa can enhance the output quality of the Autshumato Machine Translation Web Service. This research aims to assist in strengthening the Autshumato Machine Translation Web Service system so that it is a more useful translation tool for all of South Africa's official languages, which acts in line with the inclusionary nature of the DHET's language policy (Skosana & Mlambo, 2021:2).

Another technological innovation for language accessibility in use at NWU (in partnership with UP, (UNISA and Stellenbosch University) is the 'spelling checkers for South African languages' project (SADiLaR, n.d.: n.p.). This spelling checker evaluates hyphenation and spelling correctness across ten of South Africa's official languages, excluding English, and the spelling checker can be accessed for free (SADiLaR, n.d.:n.p.).

5.2.2.2.1 Implementation at the NWU

As previously noted, the current NWU language policy states that English, Setswana, Sesotho and Afrikaans are considered the "official languages of the NWU" (North-West University, 2018:2). However, the policy further adds that Setswana and Sesotho must be promoted as teaching and learning languages at the NWU, without reducing the importance of Afrikaans and English.

Signage on the NWU's Potchefstroom campus is primarily in Afrikaans and English. NWU's social media page postings are mainly in English; however, some images offer Afrikaans and Setswana versions. The NWU's website has a clear option on the homepage to view the site in either English, Afrikaans or Setswana. However, other pages, such as the library page, are available only in English, while other pages (such as the "bursaries" page) are available in English and Afrikaans.

5.2.2.3 University of the Free State

The main campus of the UFS, a multi-campus institution in South Africa's Free State region, is in Bloemfontein. Regarding its language policy, the university has a complicated and contentious history that reflects broader cultural developments in South Africa (Olivier & Lotriet, 2007:132). As previously noted, Afrikaans predominated as the language of instruction

in South African universities, including the UFS, throughout the apartheid era, especially after the institution was declared independent in 1950 (Olivier & Lotriet, 2007:132).

Following the end of apartheid, the new administration implemented policies to encourage multilingualism and address historical inequalities in education. The UFS, however, took some time to adapt to these modifications and kept Afrikaans as the primary language of instruction and English as a second language, offering parallel classes in both Afrikaans and English (Olivier & Lotriet, 2007:132).

In the lead-up to the #FeesMustFall movement in 2015, the UFS language policy was heavily scrutinised (Luescher, Loader & Mugume, 2017:235). In response, the UFS substantially altered its language policy. Regardless of their language background, all students would have equal access to education under the new policy, which promotes multilingualism. According to the policy, the institution supported language learning and growth and offered courses in Afrikaans, English, isiZulu and Sesotho (University of the Free State, 2016:1).

Some Afrikaans-speaking students and staff, however, felt that their language and culture were being marginalised and opposed the new language policy, after which further modifications to the policy were made, allowing for more flexibility and encouraging the use of multilingualism at the institution (University of the Free State, 2016:1).

The UFS language policy currently states that English is the main MOI of the university, while multilingualism is enabled through tutorials, especially for first-year students. These tutorials are offered in English, Afrikaans and Sesotho on the university's Bloemfontein Campus, while students on the Qwaqwa campus have access to tutorials in English, isiZulu and Sesotho (University of the Free State, 2016:2).

In addition to the multilingual tutorials, a heavy focus has been placed on e-learning and blended learning at UFS in the post-pandemic era (Ifeanyi, 2023:4). In order to keep these initiatives in line with both the UFS and DHET language policies, the benefits of translanguaging have been investigated at UFS (Motaung, 2021:38). This research focuses on how translanguaging might be used as a novel educational strategy to facilitate the policies of multilingualism in higher education, specifically in tutorial sessions for undergraduate students (Motaung, 2021:88). This study was conducted using technological resources such as Skype and Zoom due to the constraints of the COVID-19 pandemic.

5.2.2.3.1 Implementation at UFS

While the current UFS policy presents English as the primary language of teaching and learning and states that “formal student life interactions” must take place in English, it further states that “... [in] professional programmes such as teacher education and the training of students in Theology who wish to enter the ministry in traditional Afrikaans-speaking churches, where there is a clear market need, the parallel medium English-Afrikaans and Sesotho/isiZulu continues” (University of the Free State, 2016:2).

In correlation with its policy, the UFS website and social media postings are all in English. Signage on the UFS’s Bloemfontein campus is also mainly in English. Faculty booklets and brochures are exclusively in English, which aligns with the university’s policy that “formal student life interactions” must occur in English (University of the Free State, 2016:2).

5.2.2.4 Cape Peninsula University of Technology

The evolution of CPUT’s language policy has been marked by a shift from an emphasis on English-medium education to one that recognises and considers the linguistic diversity of its students (Kolsteeg, 2014:24). An inclusive atmosphere that recognises and embraces indigenous languages, particularly Afrikaans and isiXhosa, has been the goal of CPUT’s updated language policy, established in 2012–2013 (CPUT, 2012). The policy aims to encourage the use of these languages alongside English in academic and administrative settings as a recognition of their significance in the local context of the university.

In the ensuing years, CPUT has been conducting extensive research on the implementation and promotion of multilingualism through, for instance, translanguaging, subtitled and dubbed educational videos, and curriculum decolonisation (Obi, Ticha & Nakhooda, 2021:60; Nakhooda & Paxton, 2021:39). The CPUT Language Implementation Plan (LIP) is unique in that it proposes the cultivation of a multilingual environment in phases, with each phase presenting practical application approaches that aim to cultivate the use of Afrikaans and isiXhosa, such as the creation of multilingual glossaries (Kolsteeg, 2014:24).

In correlation with these various phases, researchers at CPUT have been investigating specifically translanguaging to develop students’ engagement with learning material (Nakhooda & Paxton, 2021:40). In this research, translanguaging is viewed as a more integrated way of fostering engagement in students, specifically in the sciences. The study

found that translanguaging was a critical, identity-affirming tool for students to promote their understanding of the study materials they were provided, and it gave students a sense of agency in their learning environment (Nakhooda & Paxton, 2021:42).

In addition, studies have been conducted at CPUT to investigate whether aligning disciplinary content to academic literacy courses at the university promoted multilingualism and decolonisation of language (Obi, Ticha & Nakhooda, 2021:61). This approach has been found to enhance students' learning experience, as they felt that their linguistic needs were being placed at the forefront of the curriculum (Obi, Ticha & Nakhooda, 2021:62).

5.2.2.4.1 Implementation at CPUT

The LIP at CPUT aims to ensure that the chosen MOI is a language that benefits its students. However, the LIP also states that its other goals include "...the development of isiXhosa as an academic/scientific language...[promoting] multilingual environment that recognises CPUT's unique African identity and historic circumstances...[and giving increasing effect] to the equal constitutional status of the three official languages of the Western Cape, namely Afrikaans, English and isiXhosa (CPUT, 2012:3).

The CPUT website is available exclusively in English, and its social media postings are only in English. Other official documents, such as the CPUT prospectus and admission requirements documents, are only available in English, with no other language options apparent.

Based on the studies which are underway at the various abovementioned higher education institutions, it is clear that steps are being taken to use technology for language accessibility and that these strategies will help universities to act in line with the language policy set out by the DHET, as well as their own internal institutional policies. However, it is also clear that multilingualism is still a barrier in everyday practice, and more feasible solutions are required to create genuinely multilingual spaces for students in academic contexts.

5.2.3 The benefits and challenges of using technology for language accessibility in South African universities

There may be several advantages to using technology to make languages more accessible in South African universities. Firstly, technology can make it easier to offer translation and

interpretation services, which can help students who are not fluent in the language of instruction better understand academic material (Bowker & Delsey, 2016:77). For example, text-to-speech and speech-to-text technologies can make lecture content accessible to students who are learning second or even third languages, while machine translation can make it easier for students who speak languages other than the MOI to grasp written academic texts (Malatji, Manamela & Sefara, 2017:236).

Secondly, technology can make it possible to create multilingual multimedia learning tools easily. For pupils from diverse linguistic backgrounds, this can improve accessibility to educational resources and encourage language development. For instance, subtitles, dubbing or transcripts in other languages can be added to videos or podcasts, allowing students to understand and engage with material that might otherwise be inaccessible (Kruger & Rafapa, 2002:4; Kruger & Kruger, 2004:113; Ayonghe, 2009:13; Hefer, 2011:2; Lacroix, 2012:5; Mahlasela, 2012:12; Kruger-Roux & Angu, 2020:64).

Despite these benefits, using technology to improve language accessibility in South African universities still has some disadvantages. Since many students lack access to the devices or internet connectivity required to use these services, the digital divide is a serious problem (Faloye & Ajayi, 2022:1736). Language processing tools like machine translation and closed captions may not always be accurate, leading to misunderstandings and misinterpretations (Chan, Kruger & Doherty, 2019:245).

Furthermore, there is a chance that the use of technology to improve language accessibility could maintain existing linguistic disparities because some languages or dialects may be given preference over others when creating these resources (Ndebele, 2020:370). Additionally, relying too heavily on technology for language accessibility may prevent students from improving their language proficiency because they may start to rely on it instead of working on their own language skills.

To promote equitable and effective language accessibility in South African universities, it is crucial to consider these problems, even though the use of technology for language accessibility can potentially deliver significant benefits.

5.2.4 Justification for choice of institutions

Their language policies have been analysed and contrasted based on how the chosen universities approach linguistic diversity, inclusivity, and the development of multilingualism. Some of the above universities have come under scrutiny for continuing to emphasise a monolingual approach, which may result in the marginalisation of students whose first language is not the dominant language. Such regulations might restrict educational opportunities, obstruct clear communication, and maintain linguistic disparities. However, the universities discussed have put policies in place that actively facilitate the use of several languages in instruction and communication and that embrace multilingualism, and their research outputs on these matters are also the most evident and easily accessible. These regulations acknowledge the value of linguistic diversity, offer tools and services for language learning, and promote the acquisition of multilingualism. Critiquing these language policies allows for a deeper understanding of the strengths and weaknesses in promoting equal access to education and fostering linguistic empowerment among students in South African universities.

5.3. Results

5.3.1 Language development at university level

The research discussed in this article shows that researchers at South African universities have developed innovative initiatives to promote multilingualism at their institutions. The research discussed in this article primarily focuses on students' academic success, their understanding of instructional materials, the use of technology to promote multilingualism in the university classroom, and the cultivation of students' critical thinking abilities concerning multilingualism. These activities address the DHET's policy, but as this article discusses, multilingualism, while promoted in the classroom, is not always fostered at the institutional level.

5.3.2 Partnerships for the promotion of multilingualism

In addition to their individual efforts, researchers at South African universities have collaborated with local and international tertiary institutions to create implementation

procedures to adhere to the DHET's policy. Such collaborations include Baqonde, the abovementioned SADiLaR programmes and initiatives promoted by Erasmus+.

The Baqonde initiative includes the NWU, UKZN, the University of Salamanca, Trinity College Dublin, the University of the Western Cape, Rhodes University and the University of Groningen and is co-funded by Erasmus+. Baqonde seeks to respond to develop the DHET's goal of promoting African languages in higher education (Baqonde, n.d.:n.p.). Using technological advancements, Baqonde has disseminated training activities, outreach programmes and "Polokelo", a "resource for first-language learning in indigenous languages", which is a multilingual resource repository for students and educators (Baqonde, n.d.:n.p.).

5.4 Conclusion

In keeping with the DHET's policy, South African universities are making strides in employing technology to improve language accessibility in higher education. The DHET policy acknowledges the value of multilingualism and the requirement to grant students equal access to education (DHET, 2020:5).

Technology is regarded as a crucial instrument in attaining these objectives because it can assist in removing many of the accessibility obstacles to language in conventional classrooms. Universities can offer courses and materials in a variety of languages by providing online tools and resources such as subtitles and dubbing, letting students select the language that is easiest for them to learn and use (Kruger & Rafapa, 2002:2; Kruger & Kruger, 2004:114; Ayonghe, 2009:13; Hefer, 2011:2; Lacroix, 2012:5; Mahlasela, 2012:12; Kruger-Roux & Angu, 2020:64). The potential benefits of using technology for language accessibility in higher education are substantial, although there are still numerous obstacles to overcome.

The use of technology to promote multilingualism and linguistic accessibility in higher education is an important development in South African universities. Although issues must be resolved to implement these technologies effectively, there are significant potential advantages for individual students and society. South African universities may take the lead in encouraging language diversity and accessibility in higher education by continuing to invest in and develop these technologies.

Chapter 6: Conclusion

6.1 Introduction

The articles in this collection have examined educational subtitling from various perspectives, including how it is perceived, how it influences cognition, how register is taken into account, and how it functions in multilingual initiatives. This work has clarified the possible advantages and limitations of educational subtitling through a thorough analysis of the current literature. The articles in this collection, while having their own distinct focus, can be linked to support the case for educational subtitling.

6.1.1 Summary of findings, discussion and implications

An intralingual analysis of the perceived value of academic English, plain English, and keyword English educational subtitles among students in NAS can give information on the effects of various subtitle strategies on comprehension and language acquisition, as was done in the first article of this collection. The use of subtitles in educational settings has developed in order to improve student comprehension and engagement (Lacroix, 2012:50). Eye-tracking, which acts as a stand-in for attention allocation in subject-specific educational videos, is one way to evaluate the usefulness of subtitling (Perego et al., 2010:262).

By studying eye-tracking patterns, the effectiveness of subtitles in capturing students' attention and guiding their comprehension can be measured, as is shown by the second article of this collection. In the first article, participants indicated that plain English subtitles were helpful to their studies, making these subtitles possibly more successful in fostering comprehension and language acquisition among students in NAS. In order to enhance learning results, educators and content creators can customise their resources by knowing which style of subtitle is perceived as more helpful.

The third article in this collection shows that language accessibility is also greatly influenced by the creation of academic and plain English word lists for undergraduate students. By bridging the gap between academic jargon and everyday language (Cutts, 2020:xxiv), these word lists help students to better understand complex ideas and concepts. Educators can improve comprehension and promote knowledge transfer by giving students specialist terminology and its plain English equivalent subtitles and accompanying word lists.

In higher education, the emphasis on linguistic accessibility goes beyond word lists. Universities in South Africa are leveraging technology to overcome linguistic challenges and advance multilingualism (DHET, 2020:17). To improve linguistic accessibility for students, technological solutions, including text-to-speech software, automated translation, LLMs and subtitles, are being used (Malatji, Manamela & Sefara, 2017:236; Mhlanga, 2023:6; Kruger-Roux & Angu, 2020:63).

The results of this collection indicate that educational subtitling has great potential as a teaching resource. It improves subject comprehension and retention, especially for students from different linguistic backgrounds and levels of language proficiency. It has been noted that the cognitive impacts of subtitling, such as improved attention, engagement, and information processing (Hefer, 2011:7), are crucial to its success in promoting educational results.

The collection also emphasises how crucial it is to consider register and language variety when implementing educational subtitling. To ensure comprehension and authenticity, subtitles must be modified to correspond with the linguistic preferences and background of the intended audience. Language barriers can be resolved, and inclusive learning environments promoted by educational subtitling, which strikes a compromise between linguistic accuracy and accessibility.

This collection has studied the role of instructional subtitling in multilingual settings. It highlights the advantages of using subtitles to encourage language acquisition, communication skills, and multilingualism. Educational resources can reach a wider audience and aid in language learning while respecting linguistic diversity by including subtitles in various languages.

Overall, this collection adds to the existing body of knowledge by offering insights into educational subtitling and its perceived value, cognitive effects, register considerations, and function in multilingual initiatives. It emphasises how essential it is to use subtitling as an inclusive instructional strategy that responds to students' linguistic demands in a multilingual environment.

6.1.2 Aims and objectives

This research has addressed multiple objectives related to using SLS (and plain English/keyword subtitles) among students in the natural sciences. Firstly, it sought to determine the perceived usefulness of subtitles among students in this discipline. The findings revealed that students found subtitles to be beneficial, as they enhanced their comprehension and understanding of complex scientific concepts. The study also examined how students used the subtitles while studying by using eye-tracking patterns to examine attention allocation. The eye-tracking data showed that students paid close attention to the subtitles and were actively using this resource.

Additionally, the study looked into whether academic terminology could be replaced in subtitles with everyday English. The findings showed that simple English subtitles successfully enhanced accessibility and comprehension, especially for students with limited scientific vocabulary and non-native English speakers.

Finally, the research gave an overview of how South African universities implemented the DHET's language policy, illuminating the efforts and advancements in incorporating language diversity and inclusivity into the higher education system. In general, this research advances the use of language policies in South African institutions and advances our understanding of the advantages of subtitles, attention allocation patterns, and alternative subtitle methodologies. These findings have real-world applications for educators, policymakers, and researchers working to improve educational opportunities and advance inclusivity in academic contexts, particularly within the natural sciences field.

6.1.2.1 Determining the perceived usefulness of SLS among students in the natural sciences

The first article of this study demonstrates that students are receptive to using subtitles when adequately equipped to engage with subtitles. The data analysis from this article supports the advantages of subtitles. These findings demonstrate that participants favour learning materials with subtitles in tertiary settings. According to the participants' replies, the subtitles are thought to benefit the participants' learning experiences (Perego et al., 2016:220). Particularly, plain English subtitles were well received and can be improved based on participant input (in a scientific setting, in the case of the present study). Generally speaking, the subtitles do not

detract from the educational materials. Instead, they are a useful mediation that accelerates participants' access to and processing of information by allowing them to pause the videos, emphasising critical information in the study materials, and allowing them to engage both aurally and visually with the materials.

The article's results support the notion that learning materials with subtitles benefit tertiary education. Very few of the participants experienced the subtitles as an interruption or a barrier to their learning, and when motivated, they specifically made good use of the plain English subtitles. In order to decide whether subtitling may be used as an academic mediation in other tertiary education settings, it is helpful to have a more comprehensive and varied understanding of viewers' perceptions of and responses to subtitled educational resources.

6.1.2.2 Exploring attention allocation in eye-tracking patterns

In multilingual contexts, the application of eye-tracking and subtitle technologies has demonstrated considerable promise for fostering comprehension and language acquisition. The research results in the second article of this study have emphasised the efficiency of eye-tracking technology and subtitles in enhancing language learning and understanding.

A benefit of educational subtitling is that it gives students in multilingual contexts an efficient way to increase their subject matter recall abilities. By providing visual signals, subtitles can aid learners in comprehending the context and meaning of new terms.

This research evaluates whether subtitles could improve language learning and comprehension using eye-tracking technology. The results of this article demonstrate that eye-tracking in subtitled videos can be useful in examining how information is processed and how students comprehend language since their watching behaviour and subtitle interaction can be very precisely measured.

Furthermore, in multilingual contexts, the use of subtitles and eye-tracking technologies can encourage inclusivity. Although the participants in this study did not use the isiZulu and Sepedi subtitles, they are nevertheless valuable and essential for English L2 speakers, particularly in higher education settings where English is often the primary MOI.

According to this study's second article, the use of eye-tracking and subtitle technology can significantly improve language understanding and acquisition in multilingual contexts. These

technologies can be used to increase subject matter recall, assist with vocabulary learning, promote comprehension, and enable access to content for those who are deaf, hard of hearing, or do not speak English as their first language.

6.1.2.3 Investigating the feasibility of replacing academic vocabulary with plain English in subtitles

The development of parallel word lists using subtitled videos offers a valuable tool for students, researchers, and educators to enhance vocabulary acquisition and linguistic analysis. It was challenging to compare a word list based on the subtitles generated for the third article of this study to a more generalised academic word list, such as the academic word list (Coxhead, 2000:232). This was due to the prevalence of subject-specific terminology in the natural sciences. As students navigate a field replete with specialised terminology, creating a parallel word list in plain English is useful to them. The production of these word lists benefited greatly from a corpus-based approach. To create subtitles that are better and easier to understand, plain English subtitles were modified to follow both subtitling and plain English conventions. Another key finding that contributes to the field of subtitling is that the clearest and most comprehensible form of subtitling within the academic context is achieved through the adoption of plain English conventions in addition to subtitling conventions. Further research could explore how best to match these two, often conflicting, sets of conventions, particularly when adapting academic English to plain English.

Additionally, audience comprehension and engagement with content are improved by plain English norms in subtitling. The use of short sentences and the avoidance of jargon are two examples of basic English rules that help to simplify language and make it more approachable. To increase the content's usability, subtitles should consider plain English conventions.

6.1.2.4 Providing an overview of the 2020 DHET language policy implementation by South African universities and other technological initiatives to advance multilingualism in higher education

South African universities are advancing their use of technology to increase linguistic accessibility in higher education in accordance with the DHET policy. They are also adjusting their internal policies and employing technological initiatives to achieve this accessibility. The

DHET policy recognises the importance of multilingualism and the need to provide all students with equitable access to education (DHET, 2020:5). This is discussed in the final article of this study.

Technology is seen as a critical tool in achieving these goals as it will help remove many of the access restrictions to language in traditional education. By offering online tools and resources like subtitles and dubbing, universities may provide courses and materials in a range of languages, allowing students to choose the language that is most convenient for them to learn and utilise (Kruger & Kruger, 2004:114; Ayonghe, 2009:13; Hefer, 2011:2; Lacroix, 2012:5; Kruger-Roux & Angu, 2020:64). Although there are still many challenges to be overcome, adopting technology to improve linguistic accessibility in higher education has significant potential benefits.

Although challenges must be overcome to use these technologies effectively, there are great potential benefits for society and individual students. By continuing to invest in and develop these technologies and their own internal language policies, South African universities are making strides in promoting language diversity and accessibility in higher education.

6.1.3 Limitations

A limitation subtitle researchers often cite is the sample size (Hefer, 2011:232; Ayonghe, 2009:106). This study's sample size depended on the module willing to be involved with the investigation. Hefer (2011:232) points out that the sample sizes of similar studies are generally small. However, a larger sample size would be ideal. Linked to the issue of sample size, there were limitations imposed on the investigation by the demography of the sample. Part of the aim of the study was to develop a model for English as MOI, which could be adapted for other languages to address and reduce the impact of this limitation.

Another possible limitation was the varying reading speeds of the different subtitle types. In her research, Hefer (2011:333) found that, compared to English subtitles, students took longer to read subtitles in Sesotho. While not a different language, it was considered whether there might be differences in reading speed between the plain English, keywords and academic English subtitles as the former two are shorter, while the academic English subtitles may take students longer to read. The study consequently assessed whether students could comprehend and retain the information in plain English and keyword subtitles. This involved following

Hefer's recommendation of using comprehension questions that refer to the subtitle content specifically and cannot necessarily "...be deduced from simply looking at the visuals on the screen" (2011:233). The reading speeds in the current study did not impact the research results.

A final limitation which was considered was students' initial introduction to SLS. South Africa is not generally considered one of the so-called subtitling countries, meaning South Africans are generally not accustomed to SLS being used in films and television. Hefer (2011:49) notes that students need to be accustomed to subtitles to draw the most benefit from their use. However, given that translated subtitles are often used on local South African television programmes, many South Africans are accustomed to seeing programmes with subtitles in some of South Africa's national languages, and this was not a limiting factor to the study.

6.1.4 Recommendations for future research

Recommendations for further research can be made based on the research study's findings. The perceived utility of subtitles in other academic subjects should be investigated, even though this study concentrated on the natural sciences. Similar research in the humanities, social sciences, or engineering can be conducted to understand the advantages and difficulties of implementing subtitles in educational materials in these fields.

Future research can look more into how students divide their attention among various subtitle components, such as text location, font size, or colour, building on the findings related to eye-tracking patterns. This can provide insights into optimising subtitle design for improved attention and comprehension.

Although the study examined the viability of employing plain English subtitles, more research can analyse the efficacy of different subtitle approaches, such as academic vocabulary subtitles, compared to plain English and bilingual subtitles. This comparative analysis can provide important insights into the best subtitle tactics for various student populations.

As language policies continue to evolve in South African universities, conducting longitudinal studies to track the implementation progress and its impact on language diversity, inclusivity, and student outcomes would be valuable. This can help identify challenges, successes, or areas for improvement in integrating language policy goals into higher education institutions.

The impact of subtitles on specific learner groups, such as students with learning disabilities, students with different language backgrounds, or students with varying levels of language proficiency can be investigated by future research. Understanding how subtitles impact these specific populations can provide tailored insights for creating inclusive educational environments.

Future research can further the understanding of the advantages of subtitles, attention allocation patterns, subtitle strategies, and language policy implementation by addressing these recommendations, resulting in evidence-based practices and policies that support effective learning and inclusivity in higher education contexts.

6.2 Conclusion

In conclusion, this study has examined the efficacy of educational subtitles and the development of parallel plain English and academic English word lists in line with subtitling and plain English conventions. Furthermore, it evaluated the implementation of subtitling and other related language accessibility technologies and research in South African universities, factoring in compliance with the DHET and internal university language policies.

The findings of this study shed light on the importance of educational subtitles as a valuable tool for enhancing comprehension and accessibility in academic settings. The creation of parallel word lists in plain English and academic English not only facilitated the production of high-quality subtitles but also promoted inclusive learning environments for students with diverse linguistic backgrounds.

This study has expanded the scope of previous subtitling research in South Africa by exploring the specific application of subtitling in plain English and language policy-related contexts, which is a relatively understudied area. By addressing this research gap, the study contributes to a more comprehensive understanding of subtitling's potential in the South African education sector. Regarding its contribution, the study has the potential to enhance current research by providing empirical data and insights that can guide instructional design, accessibility initiatives, language learning methodologies, and educational practises. It tackles the various linguistic demands of students in higher education and adds to the continuing conversation on how technology and language resources might enhance education, particularly in specialised disciplines. Furthermore, the utilisation of a case study approach provides a context-specific

viewpoint that can improve the findings' applicability to educators, administrators, and policymakers in the field of education.

Moving forward, it is imperative to continue advancing subtitling research in South Africa. Future studies could investigate the impact of educational subtitles on learning outcomes, examining factors such as comprehension, retention, and engagement. Additionally, more attention should be given to the development and validation of comprehensive guidelines and best practices for subtitling in educational settings in South Africa specifically, taking into account the diverse linguistic and cultural contexts within the country.

Furthermore, collaboration between researchers, policymakers, and educational institutions is crucial for the successful integration of subtitling and related technologies into South African universities. This collaboration should involve ongoing dialogue to align DHET and internal university language policies with the principles and benefits of educational subtitles. Moreover, efforts should be made to provide sufficient training and support for educators and staff to effectively implement these subtitling practices.

In conclusion, this study underscores the importance of educational subtitles, highlights the significance of parallel word lists, and offers insights into the successful adoption of subtitling technologies in South African universities. This research concentrates on how subtitling influences teaching and learning, especially with regard to investigating language issues. Instructors can create an inclusive learning environment by employing subtitles in a variety of formats. This method encourages a more equal and successful learning experience for students by cultivating multilingualism as well as improving comprehension and accessibility. By continuing to advance subtitling research, promoting collaboration, and implementing effective policies, the goal of a more inclusive and accessible education system that benefits all students may be realised.

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Addendum A: Academic audio-visual learning material: common word replacements from academic English to plain English

Below is an alphabetical list of scientific and/or Latin/Greek terms and phrases which were commonly used in the academic English transcripts of the videos, with the words selected as equivalents in plain English.

A

Abdomen – stomach
 Accessory nerve – eleventh cranial nerve
 Adduction – movement to the animal's midsection
Adhesio thalami – tissue linking both thalamus parts
 Adipocytes – fat cells
Alveoli – air sacs
Arcus lumbocostalis – lumbocostal arch
Arcus palatopharyngeus - palatopharyngeal arch
 Areolar – loose
Arrector pili muscles – hair erector muscles
Arteria celiaca – celiac artery
Ansa subclavia – loop below the collarbone
Antebrachium – area between the elbow and wrist
 Apical/apex – tip
Arteri carotis interna – internal carotid artery

B

Brachium – upper forelimb segment
Bronchi/bronchus – airways
Bursa – fluid sac

C

Cardiovascular system – heart and circulatory system
Carpus – small forelimb bones
 Carpal – wrist
 Caudal – back
 Caudodorsal – near the back of the tail
 Cavity – space
Cavum oris – oral space
Cecum – first part of the large intestine
Choanae – back nasal opening
Chordae tendineae – tendinous cords
Conus arteriosus – no replacement (cannot replace with *infundibulum* as it is also part of the tooth, pituitary stalk, hair follicles, lungs, sinuses, gallbladder, uterine tube, renal pelvis).
 Costodiaphragmatic – lowest end of the chest membrane sac
 Coccyx – tail bone
 Coeliac ganglia – upper stomach ganglia
 Cortex – outer layer of...
Coxae/tuber coxae/os coxae – hip bone
 Cranial – upper
 Cremaster – muscle that raises the testes
 Cruciate ligaments – ligaments connecting the thighbone and shinbone
Cupola pleura - dome-shaped layer lining the top of the rib cage

D

Diaphragm – midriff
 Diastole – when the heart relaxes
 Dissect – cut up
 Distal – further from the body
 Dorsal – top

Dorsum sellae – square bone plate
 Duct – tube
 Duodenum – first part of the small intestine

E

Embryological/Embryology – foetal stage
 Epiglottis – no replacement (commonly known term)
 Epiphysis – pineal gland
 Eustachian tube – passage linking the throat and middle ear
Extensor carpi radialis – radial forelimb muscle
Extensor carpi ulnaris – ulnar forelimb muscle
 Extracapsular ligaments – ligaments on the outer surface of the knee joint

F

Fascia – thin connective tissue
Fascia endothoracica – thin connective tissue of the spaces between the ribs
Fascia transversa – thin connective tissue of the front and sidelong stomach wall
 Femoral nerve – large leg nerve
 Femur – thigh bone
 Fibrous – threadlike
 Flexion – bending
Flexor carpi ulnaris – front ulnar forearm muscle
Foramen jugulare – jugular foramen
Foramen magnum – hole in the skull where the spine goes through
 Fossa - indentation
 Funicular – rope-like
 Fuse – combine

G

Gastrocnemius – calf muscle that flexes the knee and foot
 Glomerulus – ball-shaped loop of capillaries
 Glossopharyngeal nerve – ninth cranial nerve
 Gluteus muscle – buttock muscle

H

Hepatic – liver
Hiatus aorticus/aortic hiatus – entrance hole in the midriff
Hiatus oesophagus – midriff opening where the gullet passes from the chest to the stomach opening
 Histologically/histological/ histology – relating to tissues and their structure
Humerus – upper forelimb bone
 Hyoid bone – bone that supports the tongue
 Hypophyseal fossa – pituitary indentation

I

Ileum – last part of the small intestine
 Iliopsoas muscle – main flexor of the hip joint
Inferior vena cava/vena cava caudalis – vein carrying blood from the lower body
 Infraspinatus muscle – triangular muscle of the rotator cuff
 Inguinal – groin
 Intercostal spaces – spaces between the ribs

Intervertebral foramen – opening between every two vertebrae where nerve roots exit the spine
 Intracapsular ligaments – ligaments on the inner surface of the knee joint
 Ischiadic nerve - sciatic nerve
Isthmus – narrowing between organs

J

Jejunum - middle part of the small intestine
 Juxtaglomerular cells – granular cells

L

Lateral – to the side
Latissimus dorsi – lats
Ligamentum arteriosum – arterial ligament
Ligamentum nuchae – nuchal ligament
 Lobe – section
 Longitudinal - lengthwise
 Lumbar – lower back
 Lumbar vertebrae - vertebrae between the rib cage and the pelvis
 Lumbocostal – sidelong curved ligament

M

Macroscopic – visible to the naked eye
 Mandibular/mandible – lower jaw
Meatus – opening
 Median – middle
 Mediastinal/mediastinum - The area between the lungs
Medulla – inner area of...
 Meninges – membrane layers
 Meniscus ligaments/*menisci* – knee joint ligaments between the thighbone and shinbone
 Mesoderm – germ layer present in developing animals
 Mesothelial – pavement-like cells that line the internal organs
 Metacarpophalangeal – fetlock
 Myocard/myocardial - muscular tissue of the heart

N

Nasolacrimal duct – tear duct
 Nasal *meatus* – air passage
 Nasopharynx – upper part of the throat behind the nose
Nervi pelvini – pelvic nerves
Nervus pudendus – pudendal nerve
Nervus rectalis caudalis – inferior rectal nerves

O

Obturator internus – deep muscle of the hip joint
 Oesophagus – gullet
 Olfactory epithelium – tissue that runs along the top of the nasal cavity
 Olfactory nerve – scent nerve
 Omasum – third stomach
Omotransversarius muscle – omotransverse muscle
 Optic nerve – visual nerve
 Osseous – bony
 Osteology – study of bones

P

Palmar side – grasping side
 Palpate – touch/examine

Parietal – body wall
 Parotid – next to the ear
 Patella – kneecap
 Pericardial/pericardium – sac around the heart
 Peritoneal/peritoneum – stomach membrane
 Perineum - area between the genitals and the anus
 Phalanx – digital bones
 Pleural/pleura – membrane lining the chest
 Pleuropericardial - front fold of the torso
 Plexus – network
Plica – fold
 Prescapular – to the front of the shoulder blade
 Proprioception – kinaesthesia
 Proximal – closer to the body
 Pudendus – internal pudic nerve

R

Ramus communicans – communicating branch
 Recess – corner
Recessus supraomentalis – supraomental space
Rectus abdominis – abdominal muscle
 Reflect – bend back
Regio parotidea – parotid region
 Respiratory – breathing

S

Sacralis mediana – middle sacral artery
 Sagittal – lengthwise
 Salivary – spit
 Scapula – shoulder blade
 Semimembranosus – most medial hamstring
 Semitendinosus muscle – superficial hamstring
 Septum – divider
Serratus ventralis – ventral serrate muscle
 Sesamoid bones – round bones in the tendon
Spina ischiadica – ischial spine
 Stellate ganglion – cervicothoracic ganglion
 Subclavian artery – artery below the collarbone
 Syssarcosis – muscle that joins bones

T

Thorax/thoracic – chest
Tibia – shinbone
Torus pyloricus – pyloric torus
Trabecula(e) – dividing columns of connective tissue
 Trachea – windpipe
 Transverse – across
 Trochlear nerve – fourth cranial nerve
 Trunk – torso
 Tuber *ischadicum* – sit bones

V

Vascular system – circulatory system
Vena cava – large vein that carries blood to the heart from other areas of the body
Vena cava foramen – midriff opening
Venae hepaticae – hepatic veins
 Ventral – under
 Vertebral column – spinal column
 Vestibulocochlear nerve – auditory nerve
Vestibulum oris – oral vestibule
 Visceral – internal

Addendum B: Word frequency list based on academic English subtitles

Word	Freq.	%	Texts
ABDOMEN	1	0,044	1
ABDOMINAL	11	0,486	4
ABDOMINIS	4	0,177	1
ABDUCTOR	1	0,044	1
ABLE	1	0,044	1
ABOMASAL	1	0,044	1
ABOMASUM	2	0,088	1
ACCESSORY	3	0,133	1
ADDUCT	1	0,044	1
ADDUCTION	2	0,088	2
ADDUCTOR	3	0,133	2
ADDUCTORS	1	0,044	1
ADIPOCYTES	1	0,044	1
ADRENAL	1	0,044	1
ADRENALS	1	0,044	1
AIRWAY	1	0,044	1
AIRWAYS	3	0,133	1
ALBUGINEA	3	0,133	1
ALSO	1	0,044	1
ALVEOLI	1	0,044	1
AMPULLA	3	0,133	1
AND	13	0,574	6
ANNULUS	1	0,044	1
ANTAGONISTIC	6	0,265	1
ANTEBRACHIUM	1	0,044	1
AORTA	18	0,795	3
AORTICUS	5	0,221	3
APONEUROSIS	2	0,088	1
ARCH	1	0,044	1
ARCHES	1	0,044	1
ARCUS	5	0,221	4
AREA	1	0,044	1
AREAS	1	0,044	1
AREOLAR	2	0,088	1
ARRECTOR	1	0,044	1
ARTERI	2	0,088	2
ARTERIA	4	0,177	2
ARTERIAL	6	0,265	1
ARTERIES	1	0,044	1
ARTERIOSUM	3	0,133	1
ARTERIOSUS	5	0,221	2
ARTERY	22	0,972	4
ASCENDENS	1	0,044	1
ASCENDING	5	0,221	1
ASPECT	3	0,133	1
ASSOCIATED	1	0,044	1
ATRIOVENTRICULAR	1	0,044	1
ATRIUM	4	0,177	2
AXILLARY	7	0,309	3
BARORECEPTORS	1	0,044	1
BE	1	0,044	1
BICAROTID	2	0,088	1
BICEPS	2	0,088	1
BIFURCATION	1	0,044	1
BLADDER	2	0,088	1
BLOOD	3	0,133	1
BODY	2	0,088	2
BONE	1	0,044	1
BONES	1	0,044	1
BORDER	1	0,044	1
BRACHIAL	2	0,088	2
BRACHIALIS	3	0,133	1
BRACHIOCEPHALIC	5	0,221	2
BRACHIUM	1	0,044	1
BRAIN	3	0,133	1
BRONCHIAL	1	0,044	1
BULB	6	0,265	1
BULBOURETHRAL	1	0,044	1
BURSA	5	0,221	1
BY	1	0,044	1
CAN	1	0,044	1
CANAL	2	0,088	2
CAROTID	7	0,309	3
CARPAL	4	0,177	2

Word	Freq.	%	Texts
CARPI	5	0,221	2
CARTILAGINOUS	1	0,044	1
CARUNCLE	1	0,044	1
CAUDAL	28	1,237	8
CAUDALIS	14	0,618	4
CAUDALLY	9	0,398	3
CAVA	25	1,104	4
CAVERNOSUM	1	0,044	1
CAVITIES	2	0,088	1
CAVITY	33	1,458	5
CAVUM	1	0,044	1
CECUM	2	0,088	1
CELIAC	1	0,044	1
CELIACA	2	0,088	1
CELL	1	0,044	1
CELLS	10	0,442	1
CENTRAL	1	0,044	1
CEREBELLUM	1	0,044	1
CERVICAL	7	0,309	4
CERVIX	5	0,221	1
CHAIN	1	0,044	1
CHEMORECEPTORS	1	0,044	1
CHOANAE	2	0,088	1
CHORDAE	1	0,044	1
CIRCULATION	7	0,309	2
CLOSE	1	0,044	1
COELIAC	1	0,044	1
COELOM	3	0,133	2
COFFIN	2	0,088	1
COLLATERAL	4	0,177	2
COLON	8	0,353	1
COLUMN	1	0,044	1
COMMON	5	0,221	2
COMMUNICANS	1	0,044	1
COMPONENT	1	0,044	1
COMPONENTS	3	0,133	2
CONCHA	4	0,177	1
CONCHAE	5	0,221	1
CONNECTIVE	3	0,133	2
CONTORTI	2	0,088	1
CONTRACT	1	0,044	1
CONTRACTS	1	0,044	1
CONUS	2	0,088	2
COPULA	1	0,044	1
CORD	11	0,486	3
CORDS	5	0,221	1
CORNU	1	0,044	1
CORONARY	2	0,088	1
CORPUS	14	0,618	2
CORTEX	5	0,221	3
COSTAL	2	0,088	1
COSTODIAPHRAGMATICUS	3	0,133	2
COXAE	1	0,044	1
CRANIAL	32	1,413	5
CRANIALIS	2	0,088	1
CRANIALY	3	0,133	2
CREMASTER	4	0,177	1
CRIBRIFORM	1	0,044	1
CRUCIATE	5	0,221	1
CRUCIATES	1	0,044	1
CUOLA	1	0,044	1
CURVATURE	1	0,044	1
DARTOS	3	0,133	1
DEEP	6	0,265	1
DEFERENS	9	0,398	1
DEFERENT	1	0,044	1
DELTOID	1	0,044	1
DESCENDENS	1	0,044	1
DESCENDING	5	0,221	1
DEVELOPMENT	1	0,044	1
DIAPHRAGM	4	0,177	3
DIFFUSE	2	0,088	1
DIGESTIVE	2	0,088	1
DIGITAL	7	0,309	2

Word	Freq.	%	Texts
DISTAL	2	0,088	2
DORSAL	10	0,442	7
DORSI	1	0,044	1
DORSUM	1	0,044	1
DRAINAGE	6	0,265	1
DUCT	6	0,265	2
DUCTUS	12	0,530	3
DUODENUM	7	0,309	2
EJACULATORY	1	0,044	1
ELBOW	5	0,221	1
EMBRYOLOGICAL	1	0,044	1
ENDOCOELOM	1	0,044	1
ENDOCRINE	17	0,751	1
ENDOTHORACICA	1	0,044	1
EPIDIDYMIS	4	0,177	1
EPIGLOTTIS	9	0,398	2
EPIPHYSIS	3	0,133	1
EPITHELIUM	2	0,088	2
EQUINA	1	0,044	1
ETHMOIDAL	4	0,177	1
EUSTACHIAN	3	0,133	1
EXCAVATIO	2	0,088	1
EXOCRINE	1	0,044	1
EXTEND	2	0,088	1
EXTENSION	3	0,133	2
EXTENSOR	9	0,398	3
EXTENSORS	4	0,177	2
EXTERNAL	10	0,442	2
EXTRACAPSULAR	1	0,044	1
EXTRINSIC	4	0,177	1
FACT	1	0,044	1
FALLOPIAN	2	0,088	1
FASCIA	14	0,618	2
FAT	1	0,044	1
FEEL	1	0,044	1
FEMORAL	5	0,221	3
FEMORIS	3	0,133	1
FEMUR	1	0,044	1
FETLOCK	4	0,177	2
FIBRE	2	0,088	1
FIBRES	3	0,133	1
FIBROSUM	1	0,044	1
FIMBRIAE	1	0,044	1
FINGERS	1	0,044	1
FLEX	1	0,044	1
FLEXION	6	0,265	3
FLEXOR	5	0,221	2
FLEXORS	6	0,265	2
FLEXURE	5	0,221	1
FLUID	2	0,088	1
FOLLICLE	5	0,221	1
FOLLICLES	3	0,133	3
FORAMEN	6	0,265	4
FORNIX	2	0,088	1
FOSSA	1	0,044	1
FRONT	2	0,088	2
FRONTAL	4	0,177	1
GANGLIA	7	0,309	1
GANGLION	5	0,221	2
GASTROCNEMIUS	3	0,133	1
GENITALIS	2	0,088	1
GIRDLE	2	0,088	1
GLAND	13	0,574	3
GLANDS	3	0,133	2
GLANS	3	0,133	1
GLOSSOPHARYNGEAL	3	0,133	1
GLUTEOBICEPS	2	0,088	1
GLUTEUS	1	0,044	1
GOT	2	0,088	1
GRAAFIAN	1	0,044	1
GRACILIS	1	0,044	1
GROOVE	2	0,088	2
GROUP	1	0,044	1
GROUPS	4	0,177	1
GUT	1	0,044	1
HARD	1	0,044	1
HEART	2	0,088	2
HEMAL	2	0,088	1
HEPATIC	1	0,044	1
HEPATICAE	1	0,044	1

Word	Freq.	%	Texts
HIATUS	8	0,353	4
HIND	1	0,044	1
HOCK	1	0,044	1
HORMONES	1	0,044	1
HORN	2	0,088	1
HORNS	3	0,133	1
HUMERUS	1	0,044	1
HYOID	1	0,044	1
HYPOGASTRIC	1	0,044	1
HYPOPHYSEAL	1	0,044	1
HYPOPHYSIS	2	0,088	1
HYPOTHALAMUS	3	0,133	1
IISCHIOCAVERNOSUS	1	0,044	1
ILEUM	2	0,088	1
ILIAC	10	0,442	2
ILIOPSOAS	2	0,088	1
IN	1	0,044	1
INCISION	1	0,044	1
INFRASPINATUS	2	0,088	1
INFUNDIBULUM	3	0,133	1
INGUINAL	3	0,133	3
INGUINALIS	1	0,044	1
INLET	1	0,044	1
INTERCOSTAL	3	0,133	1
INTERNA	7	0,309	2
INTERNAL	10	0,442	3
INTERNUS	1	0,044	1
INTERVERTEBRAL	1	0,044	1
INTRACAPSULAR	2	0,088	1
INTRAOSSEOUS	1	0,044	1
INTRAPELVIC	5	0,221	1
INTRAPHARYNGIUM	3	0,133	1
INTRINSIC	5	0,221	1
IS	1	0,044	1
ISCHIADIC	2	0,088	1
ISCHIADICA	1	0,044	1
ISCHIADICUM	1	0,044	1
ISCHIADICUS	1	0,044	1
ISCHIATIC	5	0,221	2
ISCHIOCAVERNOSUS	2	0,088	1
ISLETS	1	0,044	1
ISTHMUS	1	0,044	1
ITHORAX	1	0,044	1
I'VE	1	0,044	1
JEJUNUM	6	0,265	1
JOINT	19	0,839	3
JOINTS	4	0,177	2
JUGULARE	1	0,044	1
JUXTAGLOMERULAR	2	0,088	1
KIDNEY	1	0,044	1
KIDNEYS	4	0,177	2
KNEE	2	0,088	1
LABIA	1	0,044	1
LAMINA	6	0,265	1
LANGERHANS	1	0,044	1
LATA	1	0,044	1
LATER	1	0,044	1
LATERAL	11	0,486	6
LATERALLY	1	0,044	1
LATISSIMUS	2	0,088	1
LATUM	1	0,044	1
LEFT	6	0,265	3
LIGAMENT	3	0,133	2
LIGAMENTS	8	0,353	2
LIGAMENTUM	7	0,309	3
LIMB	3	0,133	2
LONGITUDINAL	1	0,044	1
LOWER	3	0,133	1
LUMBAR	12	0,530	3
LUMBO	2	0,088	1
LUMBOCOSTALIS	3	0,133	2
LUMBOCOSTALUS	1	0,044	1
LUMBOSACRAL	1	0,044	1
LUTEUM	6	0,265	2
LYMPH	38	1,678	3
LYMPHATIC	2	0,088	1
LYMPHATICS	1	0,044	1
MAGNUM	1	0,044	1
MAJOR	1	0,044	1
MAMMARY	1	0,044	1

Word	Freq.	%	Texts
MANDIBULAR	3	0,133	1
MARROW	1	0,044	1
MAXILLA	2	0,088	1
MAXILLARY	2	0,088	1
MEAN	1	0,044	1
MEATUS	4	0,177	1
MEATUSES	2	0,088	1
MEDIAL	9	0,398	3
MEDIAALLY	1	0,044	1
MEDIAN	2	0,088	1
MEDIANA	1	0,044	1
MEDIASTINAL	3	0,133	2
MEDIASTINI	1	0,044	1
MEDIASTINUM	14	0,618	3
MEDIUS	1	0,044	1
MEDULLA	5	0,221	3
MEMBRANA	1	0,044	1
MEMBRANE	1	0,044	1
MENISCI	2	0,088	1
MESENTERIC	8	0,353	3
MESODERM	1	0,044	1
MESODUODENUM	2	0,088	1
MESORECTUM	1	0,044	1
MESOVARIUM	1	0,044	1
METACARPOPHALANGEAL	1	0,044	1
MIDDLE	4	0,177	2
MINOR	1	0,044	1
MUSCLE	21	0,928	5
MUSCLES	13	0,574	4
MY	1	0,044	1
MYOCARD	1	0,044	1
MYOCARDIAL	3	0,133	1
NASAL	12	0,530	1
NASOLACRIMAL	1	0,044	1
NASOPHARYNX	8	0,353	2
NERVE	40	1,767	4
NERVES	15	0,663	2
NERVI	4	0,177	2
NERVOUS	7	0,309	2
NERVUS	2	0,088	1
NEUROENDOCRINE	2	0,088	1
NODE	29	1,281	2
NODES	9	0,398	3
NUCHAE	2	0,088	1
OBLIQUE	9	0,398	2
OBTURATOR	2	0,088	2
OESOPHAGUS	10	0,442	4
OESTROGENS	1	0,044	1
OF	12	0,530	2
OLFACTORY	2	0,088	1
OMASAL	1	0,044	1
OMASUM	1	0,044	1
OMOTRANSVERSARIUS	1	0,044	1
ONLY	1	0,044	1
OPTIC	1	0,044	1
OR	1	0,044	1
ORGANS	3	0,133	2
ORIS	2	0,088	1
OSTIUM	3	0,133	1
OUTFLOW	4	0,177	1
OVARIALES	1	0,044	1
OVARIAS	1	0,044	1
OVARIUM	1	0,044	1
OVARY	4	0,177	2
PALATAL	1	0,044	1
PALATINE	1	0,044	1
PALATOPHARYNGEUS	1	0,044	1
PALETTE	5	0,221	1
PALMAR	1	0,044	1
PAMPINIFORM	1	0,044	1
PAMPINIFORMIS	1	0,044	1
PANCREAS	5	0,221	1
PARAFOLLICULAR	3	0,133	1
PARAGANGLIA	1	0,044	1
PARANASAL	2	0,088	1
PARASYMPATHETIC	8	0,353	2
PARATHYROID	5	0,221	1
PARATHYROIDS	1	0,044	1
PARENCHYMA	3	0,133	1
PARIETAL	1	0,044	1

Word	Freq.	%	Texts
PAROTID	3	0,133	1
PART	1	0,044	1
PASTERN	2	0,088	1
PATCHES	2	0,088	2
PATELLA	1	0,044	1
PATHWAY	1	0,044	1
PECTORAL	1	0,044	1
PELVIC	7	0,309	4
PELVINI	5	0,221	3
PELVIS	5	0,221	2
PENIS	21	0,928	1
PERICARDIAL	5	0,221	2
PERICARDIUM	1	0,044	1
PERINEUM	1	0,044	1
PERIPHERAL	1	0,044	1
PERITONEAL	12	0,530	3
PERITONEI	6	0,265	2
PERITONEUM	4	0,177	2
PERONEUS	2	0,088	1
PEYER	1	0,044	1
PEYER'S	1	0,044	1
PHALANX	2	0,088	1
PHARYNGEAL	2	0,088	2
PHRENIC	3	0,133	1
PILI	1	0,044	1
PLACENTA	2	0,088	1
PLANE	3	0,133	1
PLANES	1	0,044	1
PLATE	1	0,044	1
PLEURA	3	0,133	2
PLEURAE	1	0,044	1
PLEURAL	15	0,663	2
PLEUROPERICARDIAL	3	0,133	2
PLEXUS	9	0,398	4
PLICA	4	0,177	3
POPLITEAL	3	0,133	1
POSTGANGLIONIC	3	0,133	1
PREGANGLIONIC	3	0,133	1
PREPUTIUM	7	0,309	1
PRESCAPULAR	2	0,088	1
PRESSURE	1	0,044	1
PROCESSUS	8	0,353	2
PROGESTERONE	1	0,044	1
PROPER	2	0,088	1
PROPRIOCEPTION	2	0,088	1
PROPRIMUM	1	0,044	1
PROTRACT	1	0,044	1
PROTRACTION	1	0,044	1
PROTRACTOR	2	0,088	1
PROXIMAL	3	0,133	3
PROXIMALLY	1	0,044	1
PUBER	1	0,044	1
PUDENDUS	3	0,133	2
PULMONALIS	1	0,044	1
PULMONARY	10	0,442	2
PYLORICUS	1	0,044	1
QUADRICEPS	2	0,088	1
RADIALIS	3	0,133	2
RAMUS	1	0,044	1
RECESSUS	5	0,221	3
RECTALIS	3	0,133	2
RECTI	1	0,044	1
RECTOGENITALIS	1	0,044	1
RECTUM	3	0,133	1
RECTUS	2	0,088	1
RED	1	0,044	1
REFLECTION	2	0,088	1
REGION	22	0,972	5
RENAL	1	0,044	1
RENALIS	1	0,044	1
RENIN	1	0,044	1
RESPIRATION	1	0,044	1
RESPIRATORY	3	0,133	2
RETRACTION	1	0,044	1
RETRACTOR	8	0,353	2
RETROPHARYNGEAL	2	0,088	1
RHOMBOIDUS	4	0,177	1
RIGHT	5	0,221	3
ROOT	1	0,044	1
ROOTS	1	0,044	1

Word	Freq.	%	Texts
RUMEN	5	0,221	2
SAC	5	0,221	2
SACRAL	8	0,353	2
SACRALIS	1	0,044	1
SACROTUBEROUS	1	0,044	1
SACRUM	3	0,133	3
SADDLE	1	0,044	1
SAGITTAL	1	0,044	1
SALIVARY	3	0,133	2
SCAPULA	2	0,088	1
SCROTAL	1	0,044	1
SCROTUM	2	0,088	1
SECRETES	1	0,044	1
SELLA	2	0,088	1
SELLAE	1	0,044	1
SEMILUNAR	2	0,088	1
SEMIMEMBRANOSUS	3	0,133	1
SEMINIFERI	4	0,177	1
SEMITENDINOSUS	1	0,044	1
SEPTUM	2	0,088	2
SERRATUS	3	0,133	1
SESAMOID	1	0,044	1
SHEATH	6	0,265	2
SHEATHS	1	0,044	1
SHOULD	1	0,044	1
SHOULDER	7	0,309	1
SIGMOID	6	0,265	1
SINUS	6	0,265	2
SINUSES	2	0,088	1
SINUSOIDS	1	0,044	1
SOFT	4	0,177	1
SPERM	7	0,309	1
SPERMATIC	1	0,044	1
SPINA	1	0,044	1
SPINAL	17	0,751	2
SPIRAL	3	0,133	1
SPLEEN	3	0,133	2
SPLENIC	1	0,044	1
SPONGIOSUM	6	0,265	1
STALK	3	0,133	1
STELLATE	3	0,133	2
STEM	2	0,088	1
STIFLE	1	0,044	1
STRUCTURE	2	0,088	2
SUBCLAVIA	1	0,044	1
SUBCLAVIAN	5	0,221	3
SUBILIAC	3	0,133	1
SUBLUXATION	1	0,044	1
SUBPLEURAL	1	0,044	1
SUBSCAPULARIS	1	0,044	1
SULCUS	1	0,044	1
SUPERFICIAL	5	0,221	3
SUPPLY	8	0,353	3
SUPRAOMENTALIS	1	0,044	1
SUPRASPINATUS	2	0,088	1
SURFACE	2	0,088	1
SYMPATHETIC	7	0,309	2
SYNAPSE	2	0,088	1
SYNAPSES	1	0,044	1
SYNOVIAL	13	0,574	2
SYSSARCOSIS	1	0,044	1
SYSTEM	15	0,663	5
SYSTEMIC	3	0,133	2
TENDINEAE	1	0,044	1
TENDINOUS	1	0,044	1
TENDONS	2	0,088	1
TENSION	1	0,044	1
TENSOR	1	0,044	1
TERES	3	0,133	2
TERTIUS	1	0,044	1
TESTE	1	0,044	1
TESTES	6	0,265	1
THALAMUS	1	0,044	1
THAT	2	0,088	2
THE	17	0,751	5
THORACIC	13	0,574	6
THORACO	2	0,088	1
THORACOLUMBAR	1	0,044	1
THORAX	6	0,265	2
THYMUS	4	0,177	2

Word	Freq.	%	Texts
THYPOPHYSIS	1	0,044	1
THYROID	6	0,265	1
TIBIALIS	2	0,088	1
TISSUE	12	0,530	4
TO	1	0,044	1
TONSILLAR	3	0,133	1
TONSILS	1	0,044	1
TORUS	1	0,044	1
TRABECULAE	1	0,044	1
TRACHEA	6	0,265	3
TRACHEAL	1	0,044	1
TRACT	1	0,044	1
TRACTS	1	0,044	1
TRANSVERSA	1	0,044	1
TRANSVERSE	5	0,221	3
TRAPEZIUS	1	0,044	1
TRICEPS	2	0,088	1
TRIGEMINAL	1	0,044	1
TROCHLEAR	3	0,133	1
TRUNCUS	1	0,044	1
TRUNK	8	0,353	4
TUBE	4	0,177	2
TUBER	2	0,088	1
TUBULI	4	0,177	1
TUNICA	6	0,265	1
TURCICA	2	0,088	1
TURKISH	1	0,044	1
TYMPANICA	1	0,044	1
ULNARIS	2	0,088	1
UMBILICALIS	1	0,044	1
UPPER	4	0,177	1
URACHUS	1	0,044	1
URETERS	3	0,133	1
URETHRA	10	0,442	1
URETHRAL	2	0,088	1
URETHRALIS	4	0,177	1
UROGENITAL	1	0,044	1
UTERI	4	0,177	1
UTERINE	3	0,133	1
UTERUS	4	0,177	1
VAGAL	1	0,044	1
VAGINA	2	0,088	1
VAGINAE	2	0,088	1
VAGINALIS	6	0,265	2
VAGUS	8	0,353	2
VALVES	3	0,133	1
VARIABLE	1	0,044	1
VEIN	4	0,177	1
VEINS	4	0,177	2
VENA	25	1,104	4
VENAE	1	0,044	1
VENOUS	5	0,221	2
VENTRAL	11	0,486	5
VENTRALIS	3	0,133	1
VENTRICLE	10	0,442	2
VENTRICULAR	1	0,044	1
VENUM	1	0,044	1
VERTEBRAE	1	0,044	1
VERTEBRAL	1	0,044	1
VESICO	1	0,044	1
VESICULAR	3	0,133	1
VESSELS	2	0,088	1
VESTIBULOCOCHLEAR	1	0,044	1
VESTIBULUM	5	0,221	3
VISCERA	4	0,177	2
VISCERAL	1	0,044	1
VOCAL	5	0,221	1

Addendum C: Article submission/acceptance confirmation

Acceptance: Chapter 1: Perceived usefulness of academic English, plain English and keyword English educational subtitles among students in the Natural and Agricultural Sciences Faculty from an intralingual perspective. *Transformation in Higher Education*. Forthcoming.

THE 275: Manuscript Accepted for Publication, Sent to Editing Inbox x



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to Elmarie, helena.kruger-roux@up.ac.za

Ref. No.: 275

Manuscript title: Perceived usefulness of academic English, plain English
and keyword English educational subtitles among students in the Natural and
Agricultural Sciences Faculty from an intralingual perspective

Journal: Transformation in Higher Education

Dear Elmarie Kruger-Marais, Helena Kruger-Roux

We are pleased to confirm your manuscript's acceptance for publication on
13-Jun-23.

We can also confirm that the Submission and Review Department released your
manuscript to our Finalisation Department to commence the various editing
processes to secure online publication within the next 90 days (if not
sooner).

Kindly note:

1. If you need to make contact with AOSIS Publishing during the finalisation stage of your manuscript, kindly contact us per email or phone.
2. The finalisation procedure works as follows: (a) The first stage is the language editing that is returned to the corresponding Author for review. This will be the final opportunity for the corresponding Author to make text changes to the manuscript. (b) At a later stage, the editorial staff will send the corresponding author one set of galley proofs, at which time the Author will have two working days to mark any typographical errors.
3. Manuscript tracking is available on the submitting authors' journal profile. The submitting Author could visit their home page frequently to assess the stage of the manuscript.

Acceptance: Chapter 2: The use of subtitling to promote comprehension and language acquisition in educational settings: Eye-tracking as an indicator for attention allocation in subject-specific educational videos. *International Journal of Language Studies*. Forthcoming.

DECISION ON SUBMITTED ABSTRACT Inbox x ↕ 🖨 📧






S **Shange, Thembeka** Ezengetc@unisa.ac.za [via mylifeunisaac.onmicrosoft.com](mailto:via_mylifeunisaac.onmicrosoft.com) Fri, 10 Feb, 12:00 ☆ ↶ ⋮
to Elmarie, Chaka, Sibusiso, Thulile ▾

Dear Elmarie

After careful consideration of your revised abstract, we are pleased to inform you that the reviewing panel has reached a decision to accept your submission. We look forward to your manuscript.

Thanks

Regards

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Dr Thembeka Shange
Senior Lecturer
Department of English Studies
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Tel: 012 429 6954

Submission: Chapter 3: Academic versus plain English word lists: The development of parallel word lists for undergraduate students in the natural and agricultural sciences. *Transformation in Higher Education*. Outcome pending.

THE Submission 306 - Confirmation and acknowledgement of receipt Inbox x



aosis@thejournal.org.za aosis@thejournal.org.za via mylifeunisaac.onmicrosoft.com
to Elmarie

Ref. No.: 306

Manuscript title: Academic versus plain English word lists: The development of parallel word lists for undergraduate students in the natural and agricultural sciences

Journal: Transformation in Higher Education

Dear Ms Kruger-Marais

Your submission has been received by the journal and will now be processed in accordance with published timelines.

Processing time guidelines are available under the journal's 'About' section, however, please note that each submission is assessed on its individual merit and in certain circumstances processing times may differ.

You can check the status of your submission in three ways:

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