THE USE OF TOTAL COMMUNICATION APPROACH TO IMPROVE DEAF LEARNERS' WRITING SKILLS IN ENGLISH AS A SECOND LANGUAGE: A PARTICIPATORY ACTION RESEARCH IN ONE PRIMARY SCHOOL IN LERIBE

'NETE KE THEBE

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A Dissertation Submitted in fulfillment for the Master of Arts in Education

In the Faculty of Education Department of languages and social education (LASED)

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August 2024

DECLARATION

Under the auspices of The National University of Lesotho Masters of Arts in Education programme, I, Nthatile Mphats'oane, declare that I am the sole author of the dissertation "The Use of Total Communication Approach to Improve Deaf Learners Writing Skills in English as a Second Language: A Participatory Action Research In One Primary School in Leribe". I certify that I have fulfilled all requirements set out by the Faculty of Education's Department of Languages and Social Sciences and that I conducted my research in accordance with ethical guidelines. I acknowledge that the study's photographs, data, and tables are entirely mine, and that, when content was taken from the work of others, appropriate attribution was given.

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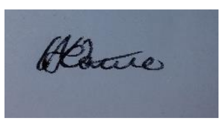
Signature: 

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Dedications

As I stand at the culmination of this academic journey, I dedicate this research to my four sisters, Mpopi, Mofeleng, Thakane, and Mabaaba Mphats'oane whose unwavering support, love, and encouragement have served as the cornerstone of my academic journey. You taught me resilience and determination as I watched you pursue your own dreams with such fervour that inspired me to push through obstacles. Not only does this research demonstrates my diligence, but it also bears witness to your support and love throughout the journey. I have achieved this milestone due to your sacrifices and support. Thank you for being my confidantes, my cheerleaders, and my best friends. I am forever grateful for everything you have done for me.

Acknowledgments

I express foremost gratitude to God Almighty, without whose help this accomplishment would never have been achieved. My supervisor, Dr. Tawanda Wallace Mataka, has my sincere gratitude for helping me complete this research. Your prudent guidance was instrumental to the completion of this research. Your expertise in Applied Linguistics provided me with the necessary tools and perspectives that moulded my understanding. I am particularly grateful for your encouragement which helped me navigate the complexities of my research.

My research journey involved multiple collaborators, including my parents. Special thanks to my parents, Mampopi and Motsamai Mphats'oane, for your love, support, and prayers. You inspired me to aim high and gave me the self-assurance I needed to follow my aspirations. Additionally, I would like to acknowledge Puseletso Lebajoa, my study partner and a friend, for her encouragement and conviction in my ability, which helped me navigate through all of the challenges. Our countless discussions not only enriched my research, but also made this journey enjoyable. Dr. Sepiriti, your valuable feedback and constructive criticisms really enhanced the caliber of my work; your insights were essential in directing my research. My cousin Nteba Lekhetho and niece Libuseng Liphoto, your financial support and faith in my ability made my academic journey much simpler. Mants'ebo Lerotholi, your inspiration prompted me to embark on this journey. I am extremely grateful.

There were periods of uncertainty and seemingly insurmountable obstacles throughout my time as a masters student. Your wise counsel helped me get through a tough period during this time, Itumeleng Shokhoe, so I could focus on my research. Bolaoane Tsunyane, the camaraderie we share and financial support created a nurturing atmosphere that was essential during trying times. Joalane Lemao, your confidence in my abilities has been a constant strength motivating me to aim high every day. Rethabile Nthebe, your varied perspectives facilitated smooth progress in my studies. My classmates, your contributions to my research enhanced its depth.

Lastly, to all deaf learners and teachers who participated, your willingness in sharing your insights and experiences has been valuable to my research. Every one of you contributed unique

perspectives that greatly enhanced this research and motivated me to advocate for more inclusive practices.

Abstract

In Lesotho, where reports indicate a higher number of disabled learners at lower grades, hearing impairment is the most prevalent disability. Despite the growing awareness of the necessity to include hearing-impaired learners in second language learning, deaf learners in Lesotho continue to face challenges in second language learning due to the absence of spoken language, differences in grammatical structures of their mother tongue and that of ESL and curriculum failing to address their unique educational needs. It is imperative for teachers to use approaches that address deaf learners' unique communication preferences. Total Communication Approach, which uses several communication modalities to facilitate communication and learning, offers a solution. Utilising an Embedded Mixed-Method design within a participatory action research framework, the study employed one group's pre-and post-test of the Hammil & Larsen 4th edition Test of Written Language to assess the efficacy of the Total Communication Approach in enhancing the writing abilities of 30 deaf learners. The research was informed by three theoretical frameworks: Person-Environment Fit Theory, Legitimation Code Theory, and Cognitive Theory of Multimedia Learning. Research prioritised real-world outcomes over rigorous adherence to any particular approach driven by pragmatism. To gather qualitative data, document analysis, focus groups, and in-depth interviews were used, and subjected to David Rose's (2005) Reading to Learn Assessing Writing tool and ATLAS.ti software version 24. Pre-test and post-test results and structured observations yielded quantitative data which was analysed by Excel and descriptive statistics. Findings indicated that spelling, grammar, and vocabulary are the main areas of difficulty for deaf learners in writing. However, the Total Communication Approach helped expand their vocabulary by demonstrating how to employ possessives and adjectives that center on the noun. Additionally, it improved spelling and vocabulary comprehension for English as a second language, as seen by the use of novel terms and well-constructed sentences. Results indicated that spelling was the most developed skill (mean 71.49), vocabulary came second (mean 36.68) and grammar the least developed skill (mean 17.17). After the intervention, the mean scores for all deaf boys were 67.67, and for all girls, they were 57.67, indicating notable progress for each gender. The study concludes that having access to information through a variety of channels contributed to comprehension and recall of writing. The study suggests creating literacy programs based on the Total Communication Approach and adjusted for different levels of deaf learners as traditional assessments might not capture their writing well enough.

Keywords: total communication approach, writing skills, deaf ESL learners, participatory action research, visual cues

Acronyms and Abbreviations

CAP: Curriculum and Assessment Policy

CRPD: Conventions on the Rights of Persons with Disability

CTML: Cognitive Theory of Multimedia Learning

DA: Document Analysis

ECoL: Examination Council of Lesotho

ESL: English as a Second Language

FGD: Focus Group Discussions

IDA: Individuals with Disability Act

LIEP: Lesotho Inclusive Education Policy

LSEN: Learners with Special Educational Needs

MoET: Ministry of Education and Training

OSV: Object Subject Verb

PE-FT: Person-Environment Fit Theory

SVO: Subject Verb Object

TCA: Total Communication Approach

TOWL: Test of Written Language

UNESCO: United Nations Educational and Scientific and Cultural Organisation

UNCR: United Nations Convention on the Rights of the Child

WHO: World Health Organisation

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CHAPTER ONE

1.0 Introduction

This chapter serves as an introduction to the study. It commences with motivation, followed by background to the study, problem statement, research question, the significance of the study, delimitations, operational definitions of the paper, the layout of the paper, and conclusion.

1.1 Motivation

My role as a special education and English as a second language teacher, as well as a Lesotho sign language interpreter who works with the deaf, motivated me to pursue this study. During my visit to one primary school in Lesotho, I witnessed the ESL problems that deaf learners face when attempting to acquire ESL. When I integrated pictures with sign language interpretation and spoken language, I observed certain modifications and increased interest in the learning process among deaf learners.

Using visual aids with sign language can motivate deaf learners to learn by lowering their emotional filters and increasing collaboration and participation. This choice was driven by the challenges that I witnessed when their sign language interpreters interpret in exact sign language while being assigned ESL tasks that are provided in exact ESL and require them to write in exact ESL grammar. Despite this, all of the identified issues were inconsistent with the Lesotho Ministry of Education and Training's demand for the development of inclusive pedagogical practices (LIEP, 2018) that call for accommodating LSENs in the learning process. Overall, my objective for conducting this research was to support broader educational aims focused at ensuring equal access to quality education for all.

1.2 Background to the Study

Total Communication Approach (TCA) is a teaching strategy that combines various modes of communication such as speech, sign language, gestures, written language, and visual aids to facilitate communication and learning (Masood et al., 2024). In other words, Beal (2015) explains TCA as a visual and tactile method of teaching foreign languages that makes up for the absence of oral input. Through the use of multiple modes of communication, teachers create an inclusive learning environment that encapsulates a dynamic blend of strategies that embraces oral and manual modalities to facilitate effective learning.

In the context of education, TCA can significantly benefit deaf learners, particularly those who are learning English as a Second Language (ESL). Put briefly, deaf learners are those people with hearing loss- a distinct condition that has varying effects on individuals. The World Health Organisation (WHO) estimates that 440 million individuals worldwide, or 5% of the total population, have hearing loss. The Individuals with Disability Act (IDA) (2017), section 300 (c) defines deafness as opposed to hearing loss as "hearing impairment so severe that a child is impaired in processing the linguistic information through hearing, with or without amplification that adversely affects a child's educational performance". Thus, the impact of deafness on them is significantly apparent, affecting their ability to communicate, participate in social activities, and access to education and employment opportunities.

Their inability to hear and access spoken languages in the classroom (Hallahan et al., 2014) causes this issue in an academic setting resulting in delayed communication, language learning, and literacy abilities. Deaf learners who are studying English as a second language, in particular, confront several difficulties in their efforts to learn this language. This challenge results from differences between deaf learners' native language structures, their phonemic development, and that of English language.

According to Marschark & Mayer (1998), English language is a phonic language that needs to be heard to be comprehended- it has a rigid basic word order for communicating the grammatical connections "Subject Verb Object (SVO)" in simple sentences, unlike sign language, which is a visual language (Berent, 2015). For this reason, hearing peers pick up on this fundamental structure in writing fast, whereas deaf peers mistake it for "Object, Subject, Verb" (OSV) as is the case in their own native language.

To substantiate, a study by Darus & Ching (2010) found that among the difficulties faced by deaf learners in English language are writing errors. These errors were related to tense and accounted for 12.1% of all errors, while prepositions (incorrect prepositions, extraneous prepositions, and omissions) accounted for 9% of all errors. Error rates for subject-verb agreement reached 8.7% (Chan, 2010). The difficulty in this situation is that the deaf language is telegraphic, which prevents them from using entire sentences in standard English to convey their ideas, as a result of variations in the way they process English language.

Without a doubt, those who suffer these difficulties as learners are stigmatised, and the extent differs between continents. The stigma attached to them can result in social marginalisation and fewer possibilities for them to improve their literacy (Agena, Boecker & Churchill, 2021). As a result, attitudes are created that may have an impact on the general support that families, communities, and educational institutions provide. In particular, Braden (2013) claims that due to impairments in auditory processing and language comprehension, deaf learners encounter particular difficulty in the development of their literacy. Further language and literacy development may be impacted by this delayed language exposure and delayed language acquisition.

In North America, the whole continent makes up 45% of deaf high scholars graduates who can write at a 9th-grade level (American Institute for Research, 2011). It appears this difficulty stems from the fact that deaf learners' native language is gestural and they have to learn a whole new language in a whole new mode at school, complete with its own vocabulary and grammatical structures. Their inability to comprehend spoken language makes writing in ESL challenging since they are unable to sound out words to understand the relationship between written and spoken sounds, known as phonological coding (Opoku-Asare, 2016).

In contrast, writing proficiency among deaf children was lower in Europe, particularly in the UK, where only 36% of deaf children met age-appropriate proficiency (University of Manchester, 2015). Furthermore, according to Rowh (2006), their inability to hear sounds had a negative impact on their academic progress. Consistent with this assertion, it seems that the issue arises due to the challenges they encounter while generating lexical conventions of written ESL (Prevost & White, 2000). As a result, they produce simple and low vocabulary sentences, making it difficult for them to write exact ESL sentences, hence performing poorly in examinations, which do not appear to cater to their unique needs.

The European Language Certificates in particular were found to be propagating injustices against the deaf people, according to the European Agency for Special Needs and Inclusive Education (2018). Teachers and test administrators appear to lack understanding and awareness of the needs and abilities of pupils who are deaf. According to European Disability Forum (2020), this might lead to a dearth of support and accommodations. For instance, deaf learners who rely on visual information may be further disadvantaged if the diagrammes used in the examinations are not well defined.

Despite the challenges deaf learners face in Europe, there appears to be a lack of awareness and understanding of deafness in several Asian cultures, which has led to the marginalisation and stigmatisation of deaf people throughout the continent (Ghazali et al., 2009). Consequently, obstacles to accessing chances for language acquisition are created. Only 23% of deaf learners could read a single sentence, which is much lower than their hearing classmates' reading abilities (University of Central Lancaster, 2013). Therefore, it may be argued that these cultural expectations that place a higher value on oral communication than sign language further hampered deaf learners' ability to learn and use longer sentences, which is necessary for the development of successful foreign language learning.

Since they fail to recognise and incorporate assessment methods that are better aligned with the strengths and abilities of the deaf, the obstacles put forth appear to have been caused by exams that are not inclusive for deaf individuals to thrive in their academic journey (World Federation of the Deaf, 2018)—resulting in biased assessments and impeding the appropriate assessment of the knowledge and skills of deaf learners. For instance, the absence of visual cues or transcripts in the written instructions on the exam papers may make it difficult for learners to completely understand the subject matter.

As implied above, there are significant regional differences in the prevalence of deafness, specifically in developing nations. According to Kratz et al. (2014), estimates imply that up to 6% of the population in some regions may be deaf or hard of hearing, with developing countries having substantially higher rates of deafness. Most African nations have populations similar to these. In research by the Universities of Chana and Bristol (2016), it was discovered that deaf learners in Ghana, Uganda, and South Africa had much lower literacy scores than their hearing counterparts and that only 4% of the deaf learners tested could read at a basic level. The results that are recorded are only for those learners who had been registered, there are those learners who had been stigmatised and hidden in communities. This implies that they are not part of the statistics. In particular, the literacy rates are lower, at 1.5% and 1.3%, respectively, in affluent nations like the USA and Canada (National Institute on Deafness and Other Communication Disorders 2017: Statistics Canada, As implied above, Kratz et al. (2014), state that estimates imply that up to 6% of the population in some developed regions may be deaf or hard of hearing, with developing countries having substantially higher rates of deafness. Most African nations have populations similar to these. In research by the Universities of Chana and Bristol (2016), it was discovered that deaf learners in Ghana, Uganda, and South Africa had much lower literacy scores than their hearing counterparts and that only 4% of the deaf learners tested could read at a basic level. The results that are recorded are only for those learners who had been registered, there are those learners who had been stigmatised and hidden in communities. This implies that they are not part of the statistics.

In consonance with De Vos & Swanepoel (2010), a significant number of deaf learners in South Africa—roughly 2% of the nation's total deaf learners' population—have delayed language development. As a result, these deaf learners might endure long-term consequences that compromise their general academic achievement. That deaf learners are currently the lowest performing group, performing worse than children in poverty, children with other disabilities, and children learning English as a second language—arriving at kindergarten unprepared for literacy, and writing—is made clear by ideas highlighted in the Anderson, California LAO Report (2016).

While the country takes pride in its multilingualism, the deaf population faces difficulties since they may not have equal access to information and knowledge (Deaf Federation of South Africa and South African Deaf Association, 2016). This deaf population thus experiences discrimination and stigma, which restrict their access to school. Accordingly, the deaf may need to learn different sign languages or adapt to other communication modes, which will hinder their capacity to acquire new languages based on their geographic location and the language spoken in their community (Adi et al., 2017). Therefore, it is necessary to consider the resources and interpretation of sign language that are offered in each of the official languages.

However, in Lesotho, which is the context of the study, in 2016, there were the highest numbers of disabled learners in lower grades compared to secondary schools, estimated at 18282 to 7395. Out of this number, the total number of registered LSENs was 373, out of which 197 were boys and 176 were girls. The prevailing disability appeared to be hearing impairment (Lesotho Inclusive Education Policy, 2018). Admittedly, these are the same deaf learners who are likely to score lower literacy skills scores, since they are deprived of a spoken language, necessary for their language acquisition and development.

Given the challenges deaf learners have when learning the English language, TCA will offer a holistic approach to address the diverse ESL learning needs of deaf Lesotho learners. It seems that through TCA, learners can connect words to objects, concepts, and even emotions. This is due to the fact that deaf learners see language visually and do not only passively take in the sounds of their environment. "When deaf children have access to visual language, they can navigate their world right away" (Marschark & Haucer, 2012, p. 12). By incorporating multiple modes of communication, teachers can create more inclusive environment to help deaf ESL learners become proficient writers.

TCA may be interpreted as a demand aimed at achieving the Sustainable Development Goal (SDG) of ensuring that the deaf have an opportunity to receive quality education and opportunities for lifelong learning. 4: High-quality instruction. TCA enables all deaf learners to access language instruction. The United Nations (2018) affirms that "Education must be accessible to every single child". This is in line with their stance as stated in the following documents: the Convention on the Rights of Persons with Disabilities (CRPD) (2006), the Salamanca Statement and Framework for Action on Special Needs Education (1994), the United Nations Convention on the Rights of the Child (UNCRC) (1989), the Incheon Declaration adopted at the World Forum (2015), and the Universal Declaration of Human Rights (1948).

To be specific, a study by Anita et al. (2012) highlighted that TCA improved reading comprehension in younger deaf learners (5-8) as compared to older deaf learners (9-12). Being exposed to TCA earlier has been associated with better literacy outcomes in deaf learners. Young learners are believed to be more adaptable to varying communication modalities, thereby potentially enhancing their literacy development. On the other hand, the gender differences in learning and cognitive processing may interact with TCA in shaping how deaf learners develop their reading and writing skills. A study by Knoors & Marschark (2012) found that when TCA was implemented in the classroom, girls performed better than boys in reading comprehension, while boys performed better from the use of sign language in TCA.

Furthermore, TCA has the potential to enhance deaf learners' social and emotional development (Kaufman & Marentette, 2013). When English language teachers employ it to emphasise vocabulary and grammatical ideas, it seems likely to enhance learners' interest in the content being taught due to its ability to create inclusive learning environments, especially for learners who struggle with social and emotional challenges in the classroom. This aligns with a study conducted by the Gallaudet University in 2019 that implemented TCA using sign language, speech and written language and found that there were improvements in writing skills of deaf learners.

Similarly, a study by Anita et al. (2012) highlighted that TCA improved writing vocabulary in deaf learners while National Technical Institute for Deaf in 2022 demonstrated the effectiveness of TCA in fostering writing development of all deaf learners. TCA is considered a multimedia learning that takes into account the unique needs of learners and helps all learners, particularly those marginalised learners optimise their talents and minimise the distractions in the classroom. "Although the poor and delayed base of deaf children makes their written English language output typically weak, they are not academically stupid" (Turnbull et al 2009: Bowe, 1998). Although their cognitive distribution is identical to that of hearing individuals, the language content of school curricula becomes a major obstacle to their educational progress worldwide.

In conclusion, TCA is an inclusive strategy that has been discovered to be helpful for learners who are deaf. As an illustration, a study conducted by (Crosson et al., 2013) discovered that deaf learners who were taught using the TCA significantly improved their writing skills compared to those who received standard training. This method decolonises the teaching and learning of English as a second language for deaf learners by acknowledging that communication is not restricted to spoken language alone. Thus, by embracing a multimodal approach to instruction, all learners are empowered to become proficient writers in ESL. The incorporation of this innovative teaching strategy may allow deaf learners to familiarise themselves with the English Language grammatical structure (SVO), even though theirs (OSV) differs. In support, Lin et al., (2017), confirmed that, when all the systems of learning are engaged simultaneously, deaf learners can develop a more integrated approach to improving their writing skills. Therefore, at the backdrop of this background, the study seeks to use TCA to improve deaf learners' writing skills in ESL.

1.3 Statement of the Problem

Since the early 20th century, extensive documentation has shown that globally, numerous learners experiencing severe to profound hearing impairments, along with some with moderate loss in their better ear without aid, complete their compulsory 12-15 years of education, yet write at approximately a 4th-grade level upon high school graduation. It is therefore apparent that the challenges that deaf learners face are multifaceted and require comprehensive solutions that consider linguistic, cultural, and educational solutions.

Considering the study literature that focuses mostly on developing literacy skills of deaf learners, it is evident that there has been an increasing awareness of the necessity for more comprehensive assessment practices and accommodations tailored to meet the needs of deaf learners in the realm of foreign language learning. In an attempt to address this, Lesotho through the Ministry of Education adopted the Lesotho Inclusive Education Policy to try to set the assessment and accommodations packages for LSEN. However, despite the adoption of the policy, LSENs continue to suffer discrimination based on their disability (Sefuthi, 2019) and second language learning in terms of use of inappropriate pedagogical strategies.

To be specific, the Examination Council of Lesotho (ECoL) does not design a differentiated examination and syllabus for deaf learners. This is in variance with the mandate/role to guarantee LIEP implementation, which calls for offering inclusive and accessible assessment packages and technical assistance as needed (Lesotho Inclusive Education Policy, 2018). Additionally, the mother tongue grammar for the deaf is different from English language grammar. Despite these dichotomies, deaf learners are still expected to learn, read, and write in exact English language prescriptive grammar which the abled/mainstream learners use.

In the teaching and learning processes, their sign language interpreters interpret the grammar they are familiar with, yet they are expected to write and understand texts written in English language grammar. This implies that "LSENs are still faced with a number of challenges because the curriculum does not cater to individual educational needs in terms of pedagogy, instructional materials, and assessment strategies" (LIEP, 2018. p. 12).

Substantial research is required to improve writing proficiency among deaf learners, with a particular focus on identifying, developing, and evaluating innovative educational interventions, such as curricula and instructional approaches, that can enhance their writing and reading abilities. Therefore, this study aims to employ the TCA (Total Communication Approach) as an instructional method to improve the writing skills of deaf learners in English as a foreign language.

1.4 Research Questions

Main Research question: What is the impact of TCA on deaf learners' writing skills in ESL?

Sub-research questions:

1. What challenges do deaf learners face in writing in English as a second language?

2. What communication modalities can be employed in Total Communication Approach to improve deaf learners writing skills?

3. How does the implementation of total communication strategies improve deaf learners' writing skills in ESL?

1.5 The Significance of the Study

This study aims to facilitate more efficient acquisition and comprehension of linguistic information for learners by emphasising literacy instruction methodologies and potentially establishing evidence-based teaching strategies to support their learning process. It also seeks to enable teachers to evaluate their practices and identify challenges in accommodating diverse learners within their classrooms. This aligns with Liep's (2018, p. 4) assertion that teachers should be empowered to utilise strategies that address the different needs of learners in inclusive environments.

Moreover, the Lesotho Ministry of Education and Training (2018) introduced the Lesotho Inclusive Education Policy, which focuses on creating physically accessible, safe, and supportive learning environments, including the provision of reasonable accommodations and assistive technologies. Therefore, this study may play a key role in encouraging the Ministry of Education and Training (MoET) to evaluate and assess the progress made towards fulfilling the objectives outlined in the policy. Implementing the Total Communication Approach (TCA) as a method to enhance the writing skills of deaf learners could significantly contribute to advancing inclusive practices in educational settings. This may also prompt the Ministry to initiate teacher-training programmes, as learners with special educational needs often do not fully participate in inclusive schools (Khumalo & Mosia, 2018), thereby supporting ongoing research into the development of writing skills among deaf learners.

1.6 Delimitations of the study

Study delimitations refer to the boundaries or constraints that researchers set to define the scope of their study (Thamae, 2023). In my view, these are intentional decisions made by the researcher regarding what aspects will be included and excluded from the study. As Terrell (2016) suggests, delimitations help to focus the research, making it more manageable and targeted. Accordingly, this study is focused on deaf ESL learners in Grade Seven at a mainstream school in Leribe. It is specifically delimited to deaf ESL learners, irrespective of the type or severity of their deafness. The study did not explore alternative methods for second language learning; rather, it employed the Total Communication Approach (TCA) to provide detailed insights into its effectiveness in enhancing the writing skills of deaf ESL learners.

1.7 Operational definitions of terms

Total Communication Approach- a method of teaching and learning languages that uses a variety of communication tools, including written language, drawings, symbols, communication boards, gestures, body language, facial expressions, and sign language, to promote efficient communication and learning. It makes it possible for those who struggle with communication to articulate themselves clearly. By utilising whichever methods are most efficient for fostering good teacher-student communication, the objective is to maximise language development.

Writing skills- These cover a wide range of elements that are necessary for communication. These are abilities that are essential for both successful academic pursuits and expressive self-expression. These include spelling (the act of writing or naming letters of words; deals with phonics), vocabulary (a variety of words used in ESL), sentence construction (the capacity to construct varied sentences), and grammar (knowledge of sentence structures, verb tenses, subject-verb agreement, and punctuation).

Deafness- It describes the whole or partial incapacity to hear noises or spoken words. According to the current study, it includes a variety of hearing abnormalities, including those in which a person is completely deaf.

Deaf learners- These are deaf learners in an educational environment who need specialized pedagogical techniques to maximize their academic progress. These learners are those whose educational experiences in an ESL learning environment are impacted by their deafness.

English as a Second Language- This is the teaching and learning of English by those for whom it is not their first language. The importance of learning this language has increased as a result of migration, globalization, and the expansion of the global economy.

1.8 The layout of the paper

This chapter acts as the study's the foundation chapter. The second chapter includes a theoretical and conceptual framework as well as a review of relevant research literature. The methodology used for the study that helped with the data production process is outlined in the next chapter, Chapter 3. Data analysis and presentation are covered in Chapter 4. Since this is a participatory action research study, the research findings and results are presented and examined according to the phases of action research (transformational and diagnostic). The final chapter presents conclusions and conclusions for further research.

1.9 Conclusion

This chapter served as the foundational chapter of the study. It comprises sections such as introduction, motivation to the study, background, research questions, the statement of the problem and significance of the study. Following, delimitations of the study are provided, the terms used on study are operationally defined, and layout of the paper served as the last section. The following chapter provides theoretical background to the study, conceptual framework and literature review.

CHAPTER TWO

Literature Review

Introduction

The preceding chapter provided a foundation for the current study. This chapter provides a theoretical framework of theories used in a study, the conceptual framework, and a literature review of the study. This section commences with a theoretical framework.

2.1 Theoretical Framework

The relationship between deafness and literacy has been extensively researched over the years. Thus, to build the framework for how deaf learners' writing skills as components of literacy might be improved, Person-Environment Fit Theory (PE-FT), Legitimation Code Theory (LCT), and Cognitive Theory of Multimedia Learning (CTML) will be incorporated into the current study (See Figure 2.1 below). The PE-FT contends that people with disabilities, including the deaf, are more likely to succeed in academic or social settings when the environment is tailored to their unique needs and strengths (Fuchs, 2009), in contrast to LCT which helps analyse the social and cultural factors influencing writing skills (Napollilo, 2018), and CTML which guide the design and evaluation of multimedia interventions for improving deaf learner writing skills (Mayor, 2009). In essence, the incorporation of the three theories helped consider the social, environmental, and cognitive factors influencing deaf learners' development of writing skills.

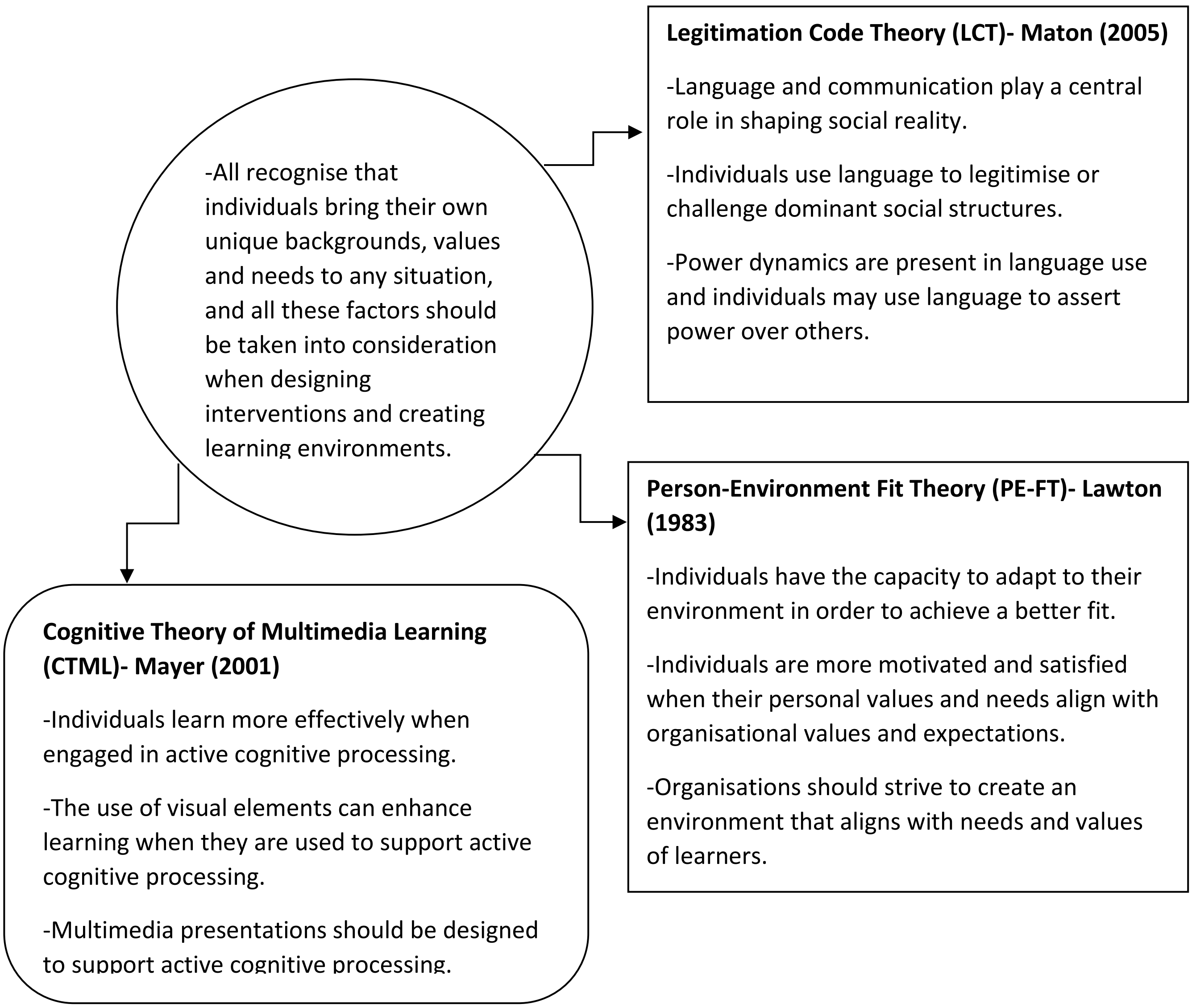

Figure 1 Concept map of the incorporated theories

2.1.1 Person-Environment Fit Theory (PE-FT)

The idea, that Lawton (1983) developed, examines how people and their environments interact. This theory holds that people look for environments that match their unique requirements, values, and qualities (Van-Vianen, 2018). Therefore, teachers should work to establish a learning environment that is accommodating to deaf learners' values and needs. This suggests that when teaching and learning writing skills, teachers should ensure that each learner is matched with the resources available in their surroundings. Thus, TCA was used in the learning process to align the deaf learners' writing skills with the environment's expectations. Physical and social environments and the person's behaviour are shaped by one another in a dynamic, ever-changing process (Lawton, 1983).

Furthermore, Harzer et al. (2017) enunciate that, people may alter their surroundings to blend in better. Thus, PE-FT will help to identify the optimal learning environments (techniques) and make sure that the physical environment fit deaf ESL learners' requirements and abilities-fit, minimising auditory distractions and promoting visual communication. By employing inclusive practices like captioning films and offering written transcripts of spoken teaching, this approach expanded epistemic access and met the communicative needs of individuals while increasing inclusiveness. According to Ndlovu-Gatsheni, "Inclusion is about creating an environment where everyone feels valued and supported, not about having a physical presence." Incorporating TCA increased diversity, provided adequate accommodations, and gave deaf learners a sense of belonging. Lawton (983) elucidates that when there is congruence between an individual's characteristics and characteristics of their environment, it leads to improved well-being.

Given that the majority of deaf learners learn best visually (Musyoka, Gentry, and Bartlett, 2016), teaching writing to deaf learners can be difficult because most information is either spoken or delivered by untrained sign language interpreters. As a result, PE-FT allowed me to tailor the classroom to each learner's visual cues, gestures, and kinaesthetic methods. By doing this, rather than merely accepting prevailing narratives, deaf learners were empowered to utilise language as a tool for forming their own knowledge. In defence, Freire (1970) highlights how education and language have the power to alter and may be used as a tool to create the world. This suggests that to overcome structural obstacles that keep the deaf from fully engaging in their education, language was made accessible to assist in the development of a more inclusive and critical perspective of learning.

According to (Kyle and Woll, 2012) giving learners unambiguous visual signals and examples during writing assignments improved their comprehension and engagement. This failure most likely resulted from the provision of a suitable learning environment for the deaf, including visual teaching. This aligns with the views of proponents of PE-FT, which maintains that educational institutions need to endeavour to create a setting that honours learners' needs and values (Peterson et al., 2009; Harzer et al., 2017) and permits the use of culturally appropriate teaching strategies. TCA was thus utilised to give the deaf a culturally acceptable way to make up for their lack of auditory input.

Despite this, social interaction and literacy development will be improved when open channels of communication are established between deaf learners and their teachers before the commencement of a class (Azizan et al., 2021). This might be considered one method of providing support services, and when combined with the use of sign language and interpretation, it provided a learning environment that was suitable for all deaf learners. To provide thorough assistance for the development of writing skills, I worked in tandem with other sign language interpreters and educational specialists with expertise in deaf education to ensure that the classroom environment was fit for deaf learners' learning.

In summary, PE-FT supports the development of an inclusive learning environment that considers the various communication styles and abilities of the deaf (Harzer et al., 2017). This is because including elements of deaf culture in writing instruction boosts the sense of involvement and belonging among deaf learners. By considering factors such as communication preferences and visual learning styles, deaf learners visually paid attention and made connections based on their cultural identity. This is consistent with Salamy, Children's Hospital of Boston (2018), which suggests that deaf learners may navigate their environment using visual language.

However, PE-FT ignores the actual learning process in favour of concentrating largely on individual characteristics and the demands of the environment (Lawton, 1985). It adequately took into consideration the intricate cognitive processes required in learning a new language in the context of deaf people's development of writing abilities. As a result, the CTML framework—which is explained in more depth below—emphasises the cognitive processes of learners throughout multimedia learning experiences and recognises that learners actively interact with multimedia materials and adjust to changing settings as they learn (Mayer & Morreno, 2003).

2.1.2 Cognitive Theory of Multimedia Learning (CTML)

The proposed theory by Mayer (2009) focuses on how people interpret information from several modalities (text, picture, and audio). It also implies that effective multimedia learning occurs when information is presented in a way that optimises the cognitive process. The design of multimedia materials to improve learning by guaranteeing the following was the main focus of the study: coherence (ensuring integration of words and visuals), signalling (highlighting information), and segmenting (breaking information into manageable chunks) (Crutchfield, 2023). To execute this, TCA was employed, and it takes into account the particular sensory and cognitive processing capacities of deaf learners. This in turn aligns with SDG 10: Reduced Inequalities (Transforming Our World: 2030 Sustainable Development Goals, 2015), by advocating for accessible information through multimedia representations.

According to Greer & Mayer (2013), active cognitive processing enhances learning for individuals. Teachers should create and use multimedia tools that provide visual accompaniment to complement written content and improve understanding for deaf learners to successfully improve the writing abilities of deaf learners. This will offer educational activities that promote involvement and mental processing (Malik & Marwaha, 2021). Consequently, a range of communication modalities—such as interactive elements like games, tests, and simulations—helped create an atmosphere for learning that maximised the participation of deaf learners. Rather than relying just on one modality of instruction, it seemed that knowledge was better received when it was provided in a multimedia style (Blumberg et al. 2019). Hernawati (2013) states that when deaf learners are involved in their learning, they feel motivated to actively digest the material being taught and successfully apply what they have learned.

Furthermore, if deaf learners aspire to take ownership of their learning and become aware of their thought processes, Albalhareth (2023) suggests that they could benefit from metacognitive methods. Metacognition includes all of the following: organising, monitoring, and evaluating one's learning. When deaf learners received specialised training on how to support them in writing, it stands to reason that including them in metacognition assisted them in being better able to cohere, signal, and segment the information presented (Samuel et al., 2017). To do this, I arranged and categorised multimedia materials that made it easier for deaf learners to navigate and understand them, thereby fostering a cogent learning environment accordingly.

Azazan et al. (2021) clarify that presenting information simultaneously in multiple formats can overwhelm cognitive processing. For this reason, I focused on enhancing comprehension through complementary visuals that did not merely reiterate the textual material. Mayer (2017) further suggests that multimedia resources should include transcripts, closed captions, and alternative formats to cater to the diverse needs of deaf learners, in line with accessibility guidelines.

Conversely, the use of visual elements facilitated the accommodation of the unique needs of deaf learners. Learning was enhanced when these visual elements promoted active cognitive processing (Pisoni et al., 2014). Given that deaf learners primarily rely on visual cues, presenting equivalent visual and verbal (signed) elements concurrently supported the integration of working memory. The use of multiple communication modalities, including visual aids, in this study reduced the cognitive strain associated with processing auditory information, making learning more accessible and engaging for deaf learners. This allowed them to focus entirely on the content being taught.

These modalities can be seen as aligning with the inclusive strategies recommended by the Lesotho Inclusive Education Policy (2018), which aims to reduce barriers to participation and learning by preventing marginalisation and discrimination. For example, to aid deaf learners in grasping vocabulary and grammar, multimedia resources such as films and images depicting objects and scenes were incorporated to illustrate key concepts (Clark & Mayer, 2016). This approach has been shown to improve learning outcomes across various domains, as noted by the National Deaf Center on Postsecondary Outcomes (2020).

Kwak et al. (2016) propose that the primary goal of multimedia presentations should be to promote active cognitive processing. By tailoring teaching strategies to the individual abilities of deaf learners, this study empowered them to engage independently and actively in the learning process. Fanon (1976) emphasises the importance of granting individuals and communities the autonomy to shape their own futures. Multimedia presentations in this study not only enhanced the writing abilities of deaf learners but also fostered a sense of agency and ownership in their learning. Furthermore, multimedia representations such as visual meters were used to evaluate deaf learners' writing activities, identifying areas that required additional practice or revision to improve cognitive processing (Suarsanaa et al., 2021). This approach facilitated an appreciation of the varied ways in which deaf learners express and comprehend themselves.

By better understanding the relationships between different ideas and concepts, deaf learners may find it easier to signal, segment, and read written texts coherently after viewing videos that illustrate key aspects of English grammar. Reducing the cognitive load of integrating diverse pieces of information was achieved by arranging relevant visual and signed components in close proximity. This aligns with Sustainable Development Goal 4: Quality Education (United Nations Conference on Sustainable Development, 2018), as the Cognitive Theory of Multimedia Learning (CTML) enabled the integration of multiple communication modalities to foster inclusive education. This ensured that deaf learners had access to appropriate communication tools, thereby enabling them to participate in educational activities and develop their writing skills accordingly.

While CTML provides valuable insights into cognitive processes and how individuals process information from different sources, integrating the Learning Communities Theory (LCT) can further enhance writing instruction for deaf learners by incorporating sociocultural elements and diverse knowledge practices.

2.1.3 Legitimation Code Theory (LCT)

According to Maton (2005), Legitimation Code Theory (LCT) is a sociological framework that examines how knowledge is legitimised within various social contexts. It focuses on how individuals acquire information and skills and how society perceives these processes. Applying the four guiding principles of LCT in the current study facilitated a deeper understanding of which types of literacy are valued or marginalised in an ESL classroom, thereby informing the development of pedagogical strategies to enhance writing skills. These principles include: legitimation code, which recognises that knowledge can be legitimised in diverse ways; semantic density, which relates to the complexity and depth of knowledge; semantic gravity, which refers to how knowledge is organised and structured in a particular domain; and epistemic relations, which assert that knowledge is not isolated but exists in relation to other forms of knowledge (Morere & Sullivan, 2017).

LCT emphasises the importance of understanding how language is used to challenge or legitimise pre-existing power imbalances within society (Napolillo, 2018). This framework allowed for an examination of the ways in which knowledge was legitimised in an English language classroom. By engaging in collaborative planning, fostering an inclusive atmosphere, and empowering deaf learners through culturally responsive teaching practices, power imbalances stemming from the learners' disabilities were challenged, thus creating a more equitable learning environment.

A key tenet of LCT is its provision of a voice for all learners, allowing them to choose a communication style that aligns with their abilities. The development of deaf learners' literacy skills may be hindered if they are not given the opportunity to take ownership of their education, access relevant resources, and receive personalised feedback on their work. By unpacking and repackaging information using visual cues of their own choosing, learners were able to improve their writing abilities. Freire (1970) underscores the importance of this approach by asserting that "words do not only communicate ideas; they also communicate social relations," highlighting the need to address potential power imbalances in the classroom, such as the dominance of one communication method over others.

Building on this, Maton and Moore (2010) argue that LCT can support the development of teaching strategies that take into account the varying degrees of difficulty in writing skills. This is related to the concept of semantic density, which recognises the varying levels of abstraction, generality, and complexity within different types of knowledge (Maton, 2010). For example, visual cues can help deaf learners who struggle with abstract concepts to access information that requires a deeper understanding of words and phrases. Similarly, the use of the Teaching Communicative Approach (TCA) provided deaf learners who excelled in abstract thinking the opportunity to assist their peers, using methods aligned with the semantic gravity and density of writing skills. This iterative process continued until all deaf learners reached a semantic threshold.

Moreover, deaf learners may find writing challenging if they do not perceive the practical application or relevance of these skills in their daily lives (Maton & Howard, 2018). To address this, the study navigated the intricate relationship between language and social reality by utilising all available communication channels, including written texts, videos, images, and sign language. These methods were essential for building a broad vocabulary and understanding complex ideas in writing. According to UKessays (2018), deaf learners can enhance their communication and writing abilities by focusing on meaningful and relevant words. By acknowledging and valuing the diversity of language traditions within the deaf community, the study fostered inclusion and helped mitigate code clashes.

In summary, LCT recognises the crucial role that language and communication play in constructing and navigating social reality, and in facilitating the transfer of knowledge. This concept, known as epistemic relations, explains how certain types of knowledge gain legitimacy by fitting into pre-existing conceptual frameworks (Maton, 2014). Within specific cultures or communities, epistemic relations refer to the values and beliefs associated with the creation of knowledge. If alternative modes of communication are not recognised or valued, deaf learners may struggle to develop their writing skills. LCT's acknowledgment that different languages can coexist and enrich one another (Purwowibowo & Hartono, 2018) enabled deaf learners to use a variety of linguistic modalities, fostering a holistic understanding of their social experiences.

2.2 CONCEPTUAL FRAMEWORK

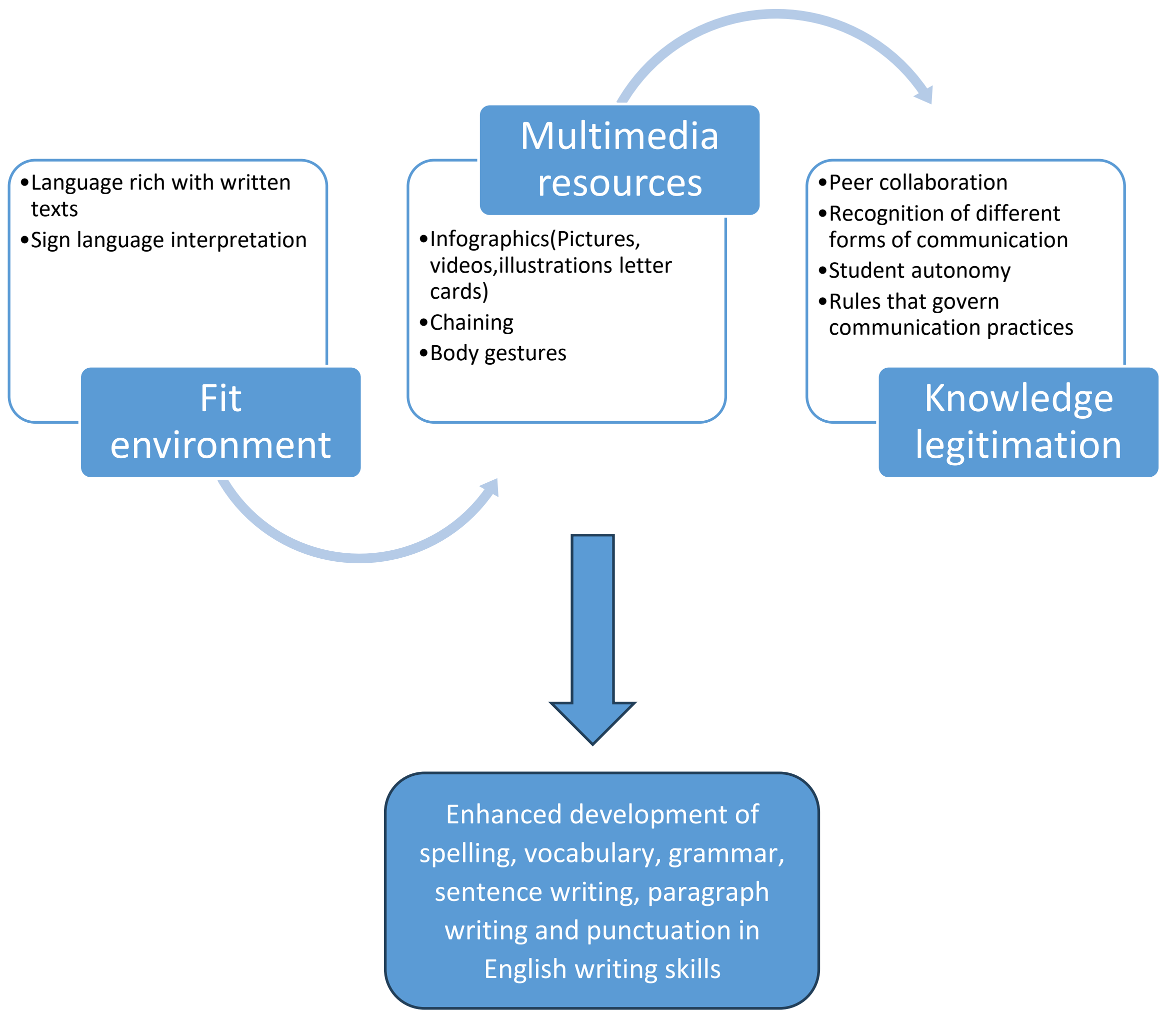

Figure. 2 Conceptual Framework

In an English language classroom, teaching writing is often a complex and thought-provoking process, particularly when working with marginalised groups such as deaf learners. Teaching English writing to these learners presents specific challenges, as it requires the development of inclusive and appropriate teaching strategies. Figure 2 above presents a conceptual framework for the Teaching Communicative Approach (TCA) to enhance deaf learners' writing abilities in an English as a second language (ESL) classroom.

Firstly, many schools fail to provide a conducive learning environment that fosters learner autonomy (Freire, 1990). Therefore, it is essential for teachers to establish a democratic learning atmosphere for deaf learners. In this instance, the teacher creates a visually stimulating and literacy-rich environment by displaying writing templates and pictures on classroom walls. This approach encourages learners to engage with written English both during lessons and in their free time. Furthermore, sign language interpretation and usage are encouraged to accommodate each learner’s preferred method of communication.

Secondly, more effective approaches are needed to stimulate enthusiasm and enjoyment in the classroom (UKessays, 2018). To meet the diverse needs of deaf learners, teachers must select multimedia materials that cater to their varying intelligences. In my approach, I utilised infographics and chaining to assist learners with their writing. According to Lee and Secora (2022), chaining helps deaf individuals connect words with images, thereby improving vocabulary and spelling.

As highlighted above, peer collaboration can significantly enhance learners' writing skills. In a collaborative learning environment, learners work together to complete assignments and share knowledge (National Education Evaluation and Development Unit, 2018). For deaf learners, this involved exchanging ideas and providing feedback on writing through the use of infographics and sign language. This process, known as peer editing, has been shown to be particularly beneficial for marginalised groups, as it helps learners identify areas for improvement and refine their writing skills (National Deaf Children’s Society, 2019).

Thirdly, it is crucial that teachers support deaf learners in peer collaboration by establishing clear communication protocols. This includes setting explicit expectations for peer tutoring to avoid misunderstandings and ensure equal participation in class activities. Deaf learners were able to actively engage in learning through the establishment of ground rules for turn-taking and the creation of specialised signs or gestures, thereby developing their writing skills (National Association of Deaf, 2021).

The importance of learner autonomy was also evident. According to Han (2021), when learners are given the opportunity to take control of their education and make decisions, they become more motivated and engaged, leading to fewer disruptions in class. During group and class-wide activities, I allowed deaf learners to choose the multimedia tools they wished to use to expand their vocabulary, improve spelling, and present their work in various formats. By utilising these semiotic tools, increased learner autonomy enabled deaf learners to break free from a culture of silence (Ndlovu-Gatsheni, 2018) and made their learning experience more meaningful and relevant to their needs. This process was repeated until all deaf learners had reached a semantic threshold.

Finally, although written language is critical for academic success, it is not the sole means of communication. To create an inclusive learning environment where all forms of expression are valued, I recognised the importance of sign language and other visual communication modes in the development of writing skills (Gallaudet University Centre on Deaf Education Research and Policy, 2018). Encouraging deaf learners to use their mother tongue alongside alternative communication methods facilitates the transfer of writing concepts to a second language (UNESCO, 2022).

2.3 Literature Review

2.3.0 Introduction

The study of the English language learning process for deaf individuals is a complex and multifaceted area that has garnered significant attention in the field of deaf education. This interest may stem from the distinct disparities between sign language and English (Hall et al., 2019). Consequently, the unique linguistic and cognitive challenges faced by deaf learners have prompted extensive research aimed at understanding the factors that influence their acquisition and proficiency in English. This section provides a comprehensive review of the literature on English language learning among deaf learners, covering topics such as language acquisition, linguistic considerations and challenges, writing in English, misconceptions and assumptions about deaf learners' written English, and educational interventions. A detailed discussion of these aspects follows, beginning with language acquisition.

2.3.1 Language Acquisition in Deaf Learners

Deaf learners often encounter challenges in acquiring spoken language as a result of their restricted access to auditory input (Brown and College, 2014). This is known as "linguistic deprivation," and it can significantly affect how deaf learners develop cognitively (Fiellin & Linda, 2013; Howerton-

Fox & Falk, 2019). For instance, language loss in deaf learners has been linked to cognitive impairments (Almomani et al.,2021; Davidson, 2011; Meinzen et al.,2019; Morgan et al.,2020; Niparko et al. 2010; Tobey et al. 2011). Although there are delays in language development, with appropriate assistance and guidance, deaf learners might still be able to gradually catch up to their hearing peers in terms of language development.

In addition, the deaf may suffer from significant delays or even total language loss if they are not exposed to any language. According to Hall (2017), there are a number of detrimental effects of inadequate language availability, including diminished quality of life, increased trauma, mental health issues, cognitive delays, and low health literacy. Consequently, having a major influence on deaf learners' linguistic skills development and providing a basis for learning other languages, including English accordingly.

Pursuant to the Language Deprivation in Deaf Children Poster (2019), age-appropriate skill development is more dependent on the timing and quality of language exposure than hearing status. Thus, it is at the backdrop of this assertion that language deprivation throughout the critical period (0 to 5) appears to have persistent implications for long-term brain development (Humphries et al. 2016 Newman et al. 2002; Laybert & D'Hondt, 2003).

It appears that human rights issues should be taken into account when evaluating language availability for deaf learners. Language deprivation has therefore been increasingly included in publications like "The Human Right to Language: Communication Access for Deaf Children (Siegal, 2008)" and "The Right of the Deaf Child to Grow Up Bilingual (Grosjean, 2001)". Thus, it is crucial to keep in mind that deaf learners have the same rights to an accessible language as other children with distinct abilities (Bauman, 2004; Humphries et al, 2013; Novel, 1995).

To be specific, "spelling errors the deaf make in writing are deletions, adjacent exchanges, insertions, substitutions, letter shifts, and transpositions" (Olson & Caramaza, 2010, p. 2). In comparison to their hearing peers, deaf learners who were exposed to language later had lower vocabulary knowledge (Howerton-Fox & Falk, 2019) and took longer to build combinations. These are the same learners who also struggle to reach age-appropriate reading levels, have less developed narrative skills (Malik & au Din, 2019), and have delays in learning and applying grammatical structures of spoken language and writing (Lund & Douglas, 2016).

Specifically, the age at which hearing loss manifests itself has a major influence on language development (Atar et al., 2021). Irrespective of the timing of language learning, it significantly impacts an individual's capacity for socialisation and communication (Baker & Scott, 2016).
As stated by Hall et al. (2017), there is a substantial possibility that long-term brain alterations will occur if deaf people are not completely able to speak and are exposed to sign language later in life, thereby leading to language delays accordingly.

Additionally, language delays seem to have an impact on the brain's neuro-linguistic structures (Marks, 2020), particularly those related to the formation of grammar and the learning of second languages. "Delayed acquisition leads to less specialisation of language in the brain," claim Laybert and D'Hondt (2003). As a result, language development is hindered and delayed. Some deaf learners do not receive early exposure to a fully accessible language which can lead to language deprivation with long-lasting effects on language acquisition and cognitive development (Hall, 2017).

These language-impaired deaf learners may also omit crucial grammatical components. In light of Polland's (2014) observation, deaf learners may have challenges in a number of areas, such as articulating ideas and feelings, understanding intricate ideas, and engaging in meaningful social interactions, the consequences of it on the deaf are undoubtedly severe. According to Gulati (2019), all of these might also be characterised as incomplete neurodevelopment. In support, Kuntzee et al. (2016, p. 77) highlight that "being deaf is not the cause of delays in language development; rather, the delays are the direct manifestations of a social world in which language is not fully accessible, and thus largely incomprehensible". This may imply that deaf learners may face social isolation and limited interaction with others, including peers and language role models, which can hinder language acquisition and learning.

Early language deprivation puts deaf children at risk for long-term, if not irreversible, consequences in their cognitive and linguistic development if they do not get information in an accessible, native language (Hall et al., 2017). Thus, one such outcome is language dysfluency, which is the incapacity to understand and articulate in language a range of abstractions, such as time and grammar, as a result become much less proficient in a second language. That is to say, disfluency may also cause deaf people to become semilingual, which is a condition in which they permanently underdevelop both sign language and English (Andrews & Dionne, 2011; Morales-Lopez, 2020). Due to cultural repercussions, educational environments are sometimes ill-equipped to support the deaf learners visual learning modes, which may be necessary for teachers to emphasise.

Nonetheless, deaf learners who learn sign language after five years might not be as adept at picking up a second language as those exposed to it from birth. According to estimates, less than 8% of deaf learners regularly get sign language in their households, and over 70% of registered deaf learners lack language access (Liddel, 2003; Institute, 2011). This suggests that deaf learners' sociocultural backgrounds do influence their learning in schools, which is a devastating reality for people who are deaf. However, Bintoro et al. (2023) criticises it stating that this sign language should be incorporated more extensively as it promotes a natural and fully accessible linguistic foundation for deaf which can enhance learning and cognitive development.

Presumably, language-impaired deaf learners are believed to suffer from fund of knowledge deficiencies (Hall et al., 2017). These deficits are best described as knowledge gaps brought on by a cumulative deficiency in environmental information (Skotara et al., 2012) or accidental learning. According to Whalen and Fewell (2017), bilingualism can therefore aid such deaf learners in improving their communication abilities and developing a stronger sense of self.

Additionally, bilingualism can support teachers in implementing inclusive teaching strategies that consider the diverse needs of learners who are deaf. However, due to a lack of accommodations or alternative evaluation techniques that are appropriate for their language experiences, these instructional strategies or standardised examinations could not fairly represent the ability of deaf learners (Neid & Clark, 2020). It appears that the auditory experience of hearing loss alone is not the only way that exposure to fully accessible language affects brain development.

To sum up, the literature indicated above has demonstrated how crucial it is for deaf learners to get thorough language exposure and early intervention to support their acquisition of English as a second language. The critical hypothesis contends that early infancy is an optimal window for language acquisition and has implications for linguistic considerations and challenges in learning English as a second language.

2.3.2 Linguistic Considerations and Challenges in English Language Learning

Linguistic concerns related to deaf people learning English include a broad range of elements, such as syntax, semantics, pragmatics, and general literacy abilities, because the auditory subtleties of spoken English can be difficult for the deaf to understand (Ramirez et al., 2014; Leonard et al., 2012; Mayberry, Chen, Witcher, & Klein, 2011). This might therefore cause differences in their understanding and language output. As a result, deaf learners may have unique difficulties in developing written skills, especially in areas like writing competence and reading comprehension.

To be precise, the linguistic considerations and challenges encompass various factors, those related to primary language differences. Cheng & Zeng (2023) and Rackauskas (2023) explain that often the first language for many deaf learners is sign language, which has a different grammatical structure from English language. These grammatical differences pose difficulties when learning English, which is linear and auditory-based. Thus, in the teaching and learning process, the pedagogical strategies relying heavily on auditory instruction will be ineffective (Bintoro et al., 2023), emanating from the teachers' lack of adequate knowledge of crucial stages in language learning of deaf.

According to Bauman & Murray (2014b), the verb agreement, sentence structure, and word order of deaf language differ from those of English. Specifically, in written English, word order must be adjusted to emphasise the information focus, indicating more complex structures and more components that support the verb (Lund & Douglas, 2016). In contrast to sign language, where the structure is still "the mouse the chat chased," standard English word order for "the cat chased the mouse" indicates that if structures were changed to "the mouse was chased by the cat," now they would indicate more complex structures while still highlighting information focus.

Furthermore, phonological components of English, including rhyme and sound segmentation, which are often taught via auditory means, may also be difficult for these deaf learners (Wolbers et al., 2020). The reason for this might be that hearing people pick up language through overheard conversations, which deaf learners miss out on. Jabeen (2022) thus notes that, speaking and listening comprehension are frequently stressed in English, which might be difficult for deaf people who are unable to rely on auditory clues. This can consequently affect vocabulary development and exposure to different language patterns for the deaf because, according to Gardenfors (2023), written English does not essentially translate from sign language, and mastery of syntax, grammar, and vocabulary may not be expressly taught.

Despite the complexities described above, the English language code is also described as organised, well-known, and quite simple to master. Thus, it can be challenging for the deaf to categorise, organise, and learn the rules, techniques, and conventions that control the application of code to create real messages and discourse that lead to effective communication (Kourrilova-Urbanczik, 2012). One of the biggest challenges for non-native writers, such as deaf writers, may be word order, as it can subtly affect meaning because English is well documented as less flexible in terms of grammatical structures.

In other words, English is less flexible in grammatical structures compared to sign language (a language used by the deaf). When a specific English semantic piece (word, phrase, or clause) is moved, a new syntactic function (verb phrase, noun phrase, or adjective phrase) must be assigned to the semantic unit in question (Hassanzadeh, 2012), matching the change in the syntactic structure. Due to the rigid sentence patterns of their language, deaf learners' learning of English is impacted by this displacement. However, this consideration is said to have been critiqued by its lack of high-quality, accessible teaching materials designed to address the specific linguistic needs of the deaf (Bintoro et al., 2023).

On the contrary, given that sign language has its own unique linguistic properties, such as manual signs, facial expressions, bodily movements, and spatial grammar, and that English is the spoken language that depends on phonology, morphology, syntax, and semantics for communication, that presents difficulties for the deaf in trying to translate directly between the two languages (Baynton, 1996; Lane, 1992; Lane, Hoffmeister & Bahan, 1996; Padden & Humphries, 1988, 2005).

All of these are demonstrated by research by Hassanzadeh & Nikkhoo (2019), which found that deaf learners' writing abilities did not improve beyond elementary school, indicating that their writing skills of English did not continue to grow throughout middle school and secondary education. These advances are probably the result of modifications made to the way deaf learners are taught the English language. Marconi (2016), however, asserts that the difficult time they have writing is because of the intricate and sometimes untranslatable link between sign language and English language.

Consistent with the above claim, deaf learners may have a smaller English vocabulary than their hearing peers, particularly in abstract concepts that are not easily represented visually. It is therefore apparent that the traditional assessment methods may not be adapted for the deaf learners which frequently misinterpret their language abilities (Phillips et al., 2022). The fact that deaf learners experience frustration or low self-confidence due to the difficulties in learning English result not only from them being taught through a modality that they do not have access to but also from the traditional teaching and assessments methods that do not cater to their linguistic needs and values.

The ramifications of the two languages are another crucial factor to consider. The use of sign language by Deaf people is tightly linked to their own rich cultural heritage, customs, and values (Marks, 2020). It is conceivable that for a large number of deaf people, sign language serves as both their mother tongue and a vital component of their identity and sense of belongingness (Higgins & Lieberman, 2016). Therefore, while trying to bridge the gap between the deaf learners' language and the English language, the cultural subtleties buried within the deaf language (ibid) might be challenging. For people using sign language and the English language to communicate effectively, it is essential to comprehend the cultural importance of specific signals and expressions. This is because deaf learners may have difficulty with a language outside their culture (one they cannot hear), since the English language structures may not be intuitive based on their primary language.

The above-described factors and difficulties can occasionally result in misconceptions, misreading, and restricted access to information (NIH, 2015). Promoting bilingualism in spoken English and sign language, a visual-spatial language, is thereby necessary to close the gap. Thus, fostering inclusiveness and successful communication for deaf people requires understanding the intricacies that come with the two languages (National Consortium of Interpreter Education Centres, 2006). Thus, it is essential to comprehend how the two languages interact to further understand what English writing specifically is like for the deaf, to design educational interventions that meet the various linguistic demands of deaf learners.

2.3.3 English writing for the deaf

Many different viewpoints may be used to study writing (Bazerman, 2016; MacAurthur & Graham, 2016; Leu et al., 2016). Regarding writing skills, there are a few different viewpoints, including sociocultural and cognitive. First of all, sociocultural perspectives on writing and writing development address a range of topics, including the various social contexts in which writing is learned and used (classrooms, workplaces, social media, and educational systems) as well as writing artifacts (pencils, keyboards, and pencils). Contrarily, there exist cognitive approaches that primarily address elements of writing related to an individual's allocation of cognitive resources across different writing processes (Gardenfors, 2023).

According to Breiter & Scardamalia (1987), writing is a complicated problem-solving activity that incorporates several iterative simultaneous processes, such as planning and viewing, rather than just a linear process that results in a final product. With experience and age, this discursive process transitioning between processes gets more complex, which helps to explain why younger writers frequently generate more linear texts than more experienced and professional writers (Chenoweth & Hayes, 2007). Since they have not yet automated every step needed to produce a well-written text, young learners of second languages, such as deaf learners, may display distinct writing habits due to their limited capacity to recursively switch between writing processes. Their low-level functions, such as transcription, spelling, punctuation, and grammar, will eventually become automated and long-term stored, freeing up space in working memory (Macutchn, 1996).

It seems that there is a missing piece in the English language writing puzzle since deaf learners of all ages and genders find it difficult to write. When difficulties with writing are considered, this knowledge gap is even more evident (Gardenfors, 2023). Their hearing loss appears to have an impact on the acquisition of spoken language, which is further compounded by their overall lack of language access (Hall, 2017; Szarkowski, 2018). This suggests that writing might be even more difficult for the deaf to learn than speaking and reading, resulting from the higher cognitive demands placed on writing assignments (Arfe, 2015; Breland et al., 2022). One of the main cognitive demands that prevents them from predicting the order of sounds is their lack of phonological awareness (Gonzalez et al., 2022). It also makes it difficult for them to recognise and retain orthographic forms of words, which causes the longest pauses in their writing.

Further, the longest pauses occur most frequently between sentences and paragraphs, serving as organic pauses for deaf writers to evaluate their work. This pattern is shared by average writers and those struggling with writing (Gardenfors et al., 2023). This is how the dysfluency in writing that deaf learners generate is impacted by their verbal experience, resulting in shorter bursts. Due to fewer spelling mistakes, these deaf learners typically pause for longer periods when producing words. That is to say, the shorter bursts might indicate a lack of automation in low-level functions, confusion in word choice, or numerous pauses before or between letters (Van Waes et al., 2016). The deaf seem to rely on a smaller vocabulary, which causes them to employ words repetitively—particularly when it comes to content words—which lowers the lexical variety of their writing (Breland et al., 2022). This, in turn, reduces the overall quality and richness of their writing.

Deaf learners frequent struggle with grammatical and syntactic complexity because of lower-density writing, which can result in mistakes or inconsistent sentence constructions (Bowers et al., 2016; Grenner et al., 2016). These are sentence forms with fewer words, indicating that it may be challenging to construct lengthier, more intricate statements. In other words, these could also lead to high lexical density, defined by a greater presence of content words and a lower proportion of functions (grammatical) words (Breland et al., 2022; Mayer & Trezek, 2018). The high lexical density could lead to a lack of coherence between sentences, an increase in syntactic errors, lexical variations, and content elaboration.

However, there is also a significant delay in the formation of lexical items, the use of markers, and spelling when it comes to vocabulary, according to Domagla-Zysk (2016). Most of all, deaf learners have difficulties discerning similar words apart, acquiring new vocabulary, and these issues are largely related to their struggles with spoken language proficiency. As a result, they tend to not produce a suitable piece of writing that is valued for its understandable language and communication. However, Nicolarakis (2020) asserts, that the difficulties are primarily caused by deaf assessments that frequently fail to capture the subtleties of the deaf's written expressions, including morphology, grammar, and syntax.

As Malik and au Din (2019) point out, it seems reasonable to assume that deaf learners have a restricted vocabulary as well as a poor understanding of English syntax and semantics. This suggests that depending on age and gender, teachers may not always provide the same assistance to deaf learners, even if they get training on how to do so. The development of writing for the deaf learners involves many different and intricate gender elements (Al-Saadi, 2020). It appears that deaf females may have an edge when it comes to writing abilities, such as a larger vocabulary, more complicated syntax, fluency, ability to edit, and higher-quality writing. As a result, during text production they are more fluent, and participate in local and global editing (Al-Saadi, 2020).

Nevertheless, as people age and go through different writing phases, age continues to have an impact on their writing development. Compared to their hearing counterparts, the deaf learners writing is typically of inferior quality (Mayer & Trezek, 2019). For example, all deaf learners may continue to hone their writing abilities in school, yet struggle with grammar and spelling. It turns out that children have trouble with them because learning written language is usually associated with speaking and understanding spoken language. However, this is not the case for deaf individuals who had a lot of support throughout their early years (Grenner et al., 2022).

Notwithstanding all the complexities involved in learning to write in the English language, deaf people face a number of challenges in writing in English as their second language. These challenges are related to the inadequate emphasis on teaching deaf people how to write (Malik and au Din, 2019). Both lexical and syntactic growth—longer texts with more clauses—will show in a child's writing development. Hence, the lack of standardised measures further impedes the ability to draw meaningful comparisons and calls for more explicit writing interventions to directly improve English writing skills among the deaf, primarily focusing on syntactic complexities and lexical development (Gardenfors, 2023, p. 213). Therefore, this section offers further information on the lexical development and syntactic complexity seen in deaf writers' English writing.

2.3.3.1 Lexical development in deaf learners' writing in English language

Due to variations in language learning and modality, such as the effect of sign language structures and visual-spatial elements, deaf learners frequently acquire distinctive lexical patterns in their written language (Lieberman & Borovsky 2020). The distinctive lexical patterns seen in deaf people highlight the significant influence that signed language has had on the evolution and organisation of written English for the deaf. Lexical development is defined by Gardenfors et al. (2023) as an increase in vocabulary and word knowledge. It may also be characterised as a child's growing vocabulary growing throughout life, starting in infancy as they pick up words from their surroundings. Hence, early exposure to environments containing natural language can influence a child's capacity to learn the vocabulary and linguistic structures needed to write proficiently.

To further define this lexical development, the metrics of lexical density and diversity are commonly employed (Jonhnson, 2009). In contrast to lexical diversity, which measures a writer's vocabulary's diversity (the more uncommon terms), lexical density evaluates a text's density by dividing the proportion of content words (nouns, verbs, adjectives, and adverbs) by the total number of words (Gardenfors,2023; Halliday, 1987). A text with a high lexical density, for example, is perceived as being more like written language, whereas a text with a low density is more like speech. Deaf writers are generally found to write with a higher lexical density; due to hearing loss rather than the usage of sign language (Gardenfors, 2023).

On the one hand, after the ages of 12 and 13, lexical diversity and text length grow. As a result, it is observed to be lower in deaf learners than in their hearing counterparts (Asker-Anason et al., 2012). English writing development presents some difficulties because, as Johnson (2009) posit that, a child's writing gets thicker and richer as their vocabulary grows. This is due to the fact that, similar to other children, the deaf' vocabulary density significantly influences their capacity for written self-expression. These are the kinds of abilities that are required for a young child to be able to create their own paragraphs and stories. Their capacity to write sentences, paragraphs, or stories that effectively express their thoughts, ideas, and feelings would be aided by their extensive vocabulary growth.

The diverse lexical patterns seen in deaf writing cast doubt on long-held beliefs about how language develops across various linguistic systems and emphasise the relationship between signed and written modes. Understanding language development and the link between signed and written languages may be significantly impacted by the uniqueness of deaf writing (Scott & Dostal, 2019). Written languages of the deaf may incorporate signed-based idioms, non-standard word ordering, and iconic representations (ibid) due to limited exposure to spoken language models and the main usage of sign language.

Consistent with the aforementioned claim, deaf people write illogical sentences with a variety of incorrect grammar and spelling use because they have had little exposure to spoken language. The described deaf writers' work demonstrates their deficiencies in spelling, which are linked to lexical-semantic language competence and grammar. These deficiencies are typified by a weaker use of sublexical spelling methods (Vizzi et al., 2023) such as reliance on phonological coding. Nonetheless, these linguistic traits in deaf writing highlight the intricate relationship between written and sign language, offering insights into deaf people's cognitive processes and language skills (Wolbers et al., 2020).

In a nutshell, deaf learners usually concentrate on learning and comprehending the meanings of words before moving on to more complicated phrases while they are learning to write (Pooresmaeil et al., 2019). Therefore, a review of literature on the syntactic complexities of deaf English language writing is necessary, focusing on the intricate text structures present in writing production units (Lu, 2011, p. 36).

2.3.3.2 Syntactic development of deaf learners' English language writing

The number of words, characters, clauses, and T-units in a text show the syntactic complexity of the text (Gardenfors, 2023). Further, the intricacy and sophistication of a sentence structure inside a text are known as syntactic complexity, according to Wu et al. (2020). This syntactic complexity is determined by examining the length of the sentence, the existence of coordination and subordination, the kinds of clauses used, and the overall complexity of the syntactic structure in writing. Consequently, age-related writing development is significantly associated with lengthier texts, comprising elements such as the use of complex words, sentences, and clauses (L'ohndorf, 2021).

Turning to the lens of English language writing, writing proficiency is mostly dependent on factors such as vocabulary, grammatical structure understanding, and the ability to organise, compose, review, and revise own work. As a result, deaf writers and English grammar have a complicated connection. Pooresmaeil et al. (2019), thereby suggests that these difficulties stem from the distinctions between written syntax in English and sign language. This is because deaf people can vary widely in their ability levels in both sign language and English, with some being extraordinarily proficient in both. Because sign language and English grammar differ, the deaf syntactic complexity is especially connected to English grammar (subject-verb agreement, proper tense, usage of articles, and prepositions).

Furthermore, the difficulties deaf people experience comprehending and using language can have a big impact on their writing abilities, making it harder for them to create texts that follow conventional English syntactic standards (Maik & Naseer au Din, 2019). Due to their limited access to spoken English, deaf learners acquire English syntax much more slowly than hearing learners (Berent, 2001; Howerton-Fox & Falk, 2019). Correspondingly, their issues with syntax are related to omissions, substitutions, redundancies, and word order errors. In spite of this, they also demonstrate challenges in producing coherent texts and seamless transitions. According to Hoffmeister et al. (2021), the difficulty with transition and cohesiveness arises from the different ways that concepts are related in sign language and English.

Deaf people can, nevertheless, write in a stilted manner while being able to correctly build relative clauses and select which pronoun to use in a given phrase. This insinuates that a rising number of words and phrases per T-unit indicates grammatical complexity, and the written work produced by the deaf may not have the "writing voice" necessary for academic success. Pooresmaeil et al. (2019), for instance, clarify that stories written by deaf people often have shorter, simpler sentences and often misuse complicated grammatical constructs such as conjunctions (and, because, and while). Therefore, the inability to know when and how to apply these structures is the root of their problems.

According to Malik & ud Din (2019), deaf learners have historically had difficulty learning Englis because of the poor quality of their input during language acquisition. Many deaf learners of English experience delays in syntax development, falling well short of their hearing peers. Conjoined phrases and sentences with relative clauses are two instances of complex grammatical constructions that make writing challenging for the deaf.

The organisation and development of ideas inside paragraphs and throughout the text can also be difficult for deaf readers to comprehend, which makes it harder for them to properly communicate their thoughts in writing. Hence, leading to the creation of incohesive sentences with a larger frequency of syntactic mistakes, lexical variants, and content elaboration (Devillars, 1991: Le et al., 2020). As such deaf people may find it difficult to comprehend how ideas are organised and developed inside paragraphs and throughout the text, that presents difficulties for them to properly communicate their views in writing.

In essence, Gardenfors (2023) found that age is essentially the best indicator of longer texts. That is to say, older deaf people write longer texts that contain more words, longer T-units, and more sentences, exhibiting corresponding syntactic development. Consistently, it is further discovered that deaf learners write texts twice as long as their hearing counterparts, who are 10–12 years old. This denotes that the deaf have a developmental pattern that is identical to that of hearing learners, but delayed for a year. Nonetheless, their sentences—which are primarily complex—lack normal English syntax, correct clause use, and sentence variety. These syntactic complexities associated with deaf' writing can lead to the misconceptions and assumptions due to societal biases, cultural differences, and understandings about deaf communication skills.

2.3.4 The misconceptions about deaf learners' writing skills

Many deaf people who primarily communicate through sign language may encounter misconceptions about their ability to write in English. Terry et al. (2017) state that these misconceptions stem from a lack of understanding of deafness, language acquisition processes, and the diverse communication needs of the deaf community.

Firstly, according to Sign Solutions (2021), deaf individuals are assumed they can learn to write in English in the same way as hearing individuals, thus surmising that they can learn through traditional-based auditory methods, similar to hearing individuals. Even though they have different learning needs just like hearing peers, deaf learners require alternative approaches to English language learning (Nunn et al. 2022), that consider their unique communication preferences and modalities, because they are "specially, linguistically, culturally, and socially different" (Higgings & Lieberman, 2016, p.10).

Additionally, it is often assumed that deaf learners' English difficulties are associated with their auditory deprivation Hall (2017). However, recent research strongly indicates that their difficulties are more likely a result of their lack of early language development. Admittedly, they do have low intelligibility of deaf speech in terms of confusing sounds and typical errors. These errors are deemed to jeopardise comprehensibility and have negative effect on intelligibility in ordinary communication (Domagala-Zysk & Kontra, 2016) in writing, particularly within the framework of foreign language.

Secondly, literature shows that sign language hinders mastery in English language writing skills, due to different grammatical structures between the two languages. However, Andrew et al. (2014) study highlighted that a strong foundation in a sign language can support the development of literacy skills in English language. This strong foundation in the deaf mother tongue can provide the visual and accessible language model to enhance overall language development. Building a strong native language seems to enhance one's comprehension of language functions generally (Cummins, 2000).

Thirdly, although some scholars may believe that deaf individuals are limited in their language abilities due to their hearing loss, Higgins & Kontra (2016) argue that deaf learners can learn and excel in multiple languages including English. This mastery or excellent learning of English indubitably happens through the provision of appropriate support, resources, and access to language-rich learning environments (Humphries et al, 2022). This also helps eliminate the belief that deaf individuals are linguistically and intellectually inferior, stemming from assertions that equate "deafness with intellectual disability (p. 10)". In reality, Hrastinski & Wilbur (2016) contend that the deaf are capable of achieving high levels of linguistic and academic proficiency when provided with language-rich environments and educational support.

All in all, it is worth noting to recognise that being deaf does not impede one's ability to master written language. In accord with Hrastinski & Wilbur (2016), the deaf can express themselves eloquently in written form showcasing creativity, critical thinking, and linguistic competence. By dispelling all the misconceptions that equate to limitations in English writing, teachers can foster inclusive educational interventions for the deaf to master their writing skills in English as a second language.

2.3.5 Educational Approaches and Interventions

In the subject of deaf education, a plethora of instructional approaches and interventions have been studied to enhance deaf learners' English language proficiency. Humphries et al. (2013) state that these deaf learners have difficulty with language-related skills, especially writing and reading. This might be because they are not familiar with English language phonology and orthography. To support the linguistic and academic development of deaf learners, strategies that stress the use of sign language in addition to written and spoken English, visual aids, technology, bilingual, and bicultural approaches have become more and more popular. This implies that while promoting written and spoken English language, all deaf pedagogical strategies ought to acknowledge the value of sign language as a foundation for cognitive development and conceptual comprehension (Bunta et al., 2016).

Deaf learners who are also ESL learners find it challenging to learn English, which may be their second language in addition to their original dialect, according to Cannon & Guardino (2013). As a result, the inclusion of assistive pedagogical techniques is crucial to provide invaluable information and support in fostering communication and catering to individual needs. In research by Alaward & Musyoka (2018), for instance, fingerspelling was employed as a pedagogical method to teach vocabulary to deaf learners and to assist the literacy development of bilingual deaf learners.

To further highlight the findings of the previously mentioned study, fingerspelling's ability and the development of literacy skills seem to be closely related since fingerspelling is a visual aid that the deaf use to decode and remember word symbols so they can write them (Crushkin, 1998; Haptonstall-Nykaza and Schick, 2007). Deaf learners can engage in meaningful language activities and get a better understanding of language concepts with the use of visual teaching aids like finger spelling (Bunta et al., 2016).

Despite this, the act of mouthing English words in tandem with fingerspelling might enhance the use of phonological strategies, as fingerspelling is linked to vocabulary and comprehension abilities. According to Alaward & Musyoka (2018), fingerspelling is more successful when a strong English representation is created to help deaf learners write with better vocabulary and to assist and improve fingerspelling technique. This can be attributed to the fact that fingerspelling can be used to recall or decipher written information, as well as to express one's cultural identity (Alaward & Musyoka, 2018; Scott, 2017). This is consistent with a study by Stone et al. (2015) that used printed words, signs, fingerspelling, and bilingual fingerspelling strategies like lexicalised fingerspelling and chaining. The researchers found that these strategies helped assist the deaf learners in recognising and picking up new vocabulary as well as improving their writing abilities.

Significantly, these strategies (visual teaching aids) are very successful when used in the teaching of phonics, word recognition, and reading comprehension. This is in line with Malik & au Din's (2019) assertion that teaching learners how to write in English is the primary objective of education. Therefore, it is seen to be essential that deaf learners also enhance their English writing literacy. However, research shows that these approaches sometimes primarily focus on certain aspects of literacy, ignoring broader aspects that influence the writing skills of those who are deaf (Current State of Knowledge: Language and Literacy of Children, Ear and Hearing, 2023).

On the other hand, several researches have demonstrated how appropriate pedagogical approaches may help deaf learners improve their reading and writing abilities. According to Henner et al. (2016), these are the same strategies that are supposed to build more welcoming and encouraging learning environments that acknowledge the contributions and abilities of the deaf. Arguably, these pedagogical approaches may not fully address the diversity among deaf learners (Manga & Masuku, 2020), including a range of abilities and communication preferences that can impact their writing development.

The above assertion is consistent with research by Sheperd & Alpert (2015), which used technological incentives as instructional strategies and found that technology promoted active and engaged learning among deaf English language learners. In Martins et al. (2015), technological interventions such as instructional software, assistive devices, and captioning technologies have been developed to establish an inclusive learning environment for the deaf. By bridging communication gaps, these technology solutions allow deaf learners to access English language content in ways that meet their specific needs (Findlater et al., 2019).

Given that deaf learners sometimes prefer visual learning strategies, the landscape of English language learning for the deaf has been profoundly impacted by the growing advancements in educational interventions and technology (Australian Disability Clearinghouse on Education and Training, 2023). Developing inclusive digital tools that cater to the needs of deaf English language learners has apparently been the subject of several studies (Prietch & Filguries, 2015; Martins et al., 2015; Abdallah & Fayyoumi, 2015; Findlater et al., 2019).

Further, the learning strategies have brought to light the challenges that prevent deaf people from using some technology and their underlying desire to interact with people without compromising their language or learning theirs. As Madrinan (2014) states, competence in a second language is a function of proficiency in one's first language. Although these digital tools are assumed to be advantageous in developing deaf literacy skills, the teachers may not be sufficiently prepared/ trained to effectively use interventions tailored for the deaf (Manga & Masuku, 2020).

All of the aforementioned, nevertheless, may be difficult in a setting where verbal or oral communication is the primary means of information delivery. For deaf learners to engage in class activities, assistive technologies are required. This agrees with the Article 3 concept of the 2019 Convention on the Rights of Persons with Disability and the United Nations Division for Social Policy, which states that all people with disabilities, including the deaf, should be fully included and allowed to participate in society. This can be accomplished by employing assistive technology, such as a laptop running Skype to provide captioning clearly and understandably (Australian Disability Clearinghouse on Education and Training, 2023). It is said that interactive learning experiences catered to the needs of deaf learners are offered through technology-based learning. These technology-based learning are mostly effective where there are no challenges in communication between teachers and deaf learners.

In conclusion, the adjustments are critical to lowering barriers to English language acquisition and promoting more participation from deaf learners. Given that knowledge is mostly obtained through written sources, it is unambiguous that deaf people must acquire writing skills to navigate well in the modern world. Also, as there is an increasing population of deaf ESL learners, there is a need for innovative teaching strategies to achieve optimal outcomes (Beth, 2019). To effectively do this, it is therefore required to include bilingual methods, sign language instruction, visual aids, and cultural competency into their English language learning process. All these are included in TCA, which is described in more depth below.

2.3.6 Total Communication Approach (TCA)

Historically, teaching deaf learners has been frustrating, given the slow progress deaf learners make. As a result, while experimenting with novel teaching methods for deaf learners, teachers must act proactively. TCA, then, gives teachers the liberty to creatively try out any strategy that could help deaf learners succeed academically. Therefore, TCA is a philosophy of learning that was brought to the field of deaf education in 1960 (Schow & Nerbone, 2007).
Wahyuningty et al (2015) found that deaf learners perceived TCA useful with average score of 75, which met the standard. MED et al. (2017) TC improves deaf learners' academic progress, helping them retain what is learnt and staying engaged with ongoing activities

Furthermore, TCA is a teaching strategy that can facilitate communication among deaf learners and was initially created by Holcomb for deaf children (Purwiwobowo & Hendjanto, 2018). According to Beal (2015), to appropriately receive and transmit information, TCA entails the simultaneous use of several communication modalities, including voice, sign language, gestures, facial expressions, fingerspelling, and visual aids. Specifically, a teacher will sign simultaneously with a spoken word, illuminating with either spelling, illustrations, or facial expression to deliver content.

In the context of education, when deaf learners learn English, they require a variety of communication strategies to facilitate interactions with their hearing peers. Since it is assumed that the deaf learns best visually (Alaward & Musyoka, 2018), it follows that they require easily accessible content. For this reason, TCA—which is recognised as a visual-tactile approach to improving deaf ESL literacy skills—has been incorporated. Undoubtedly, TCA allows English teachers to always use their creativity to make learning interesting and simple (Adi, Unsiah, Fadhilan, 2019).

For instance, Kennedy's (2012) study found that TCA was an effective method for improving deaf learners' literacy skills in English, particularly for those who were less proficient in sign language. TCA essentially assisted in the creation of a socially equitable classroom where learners from underprivileged minority groups (such as the deaf population) could also utilise language for instruction and communication. A solid foundation in a primary language—spoken or signed—is essential for the development of writing abilities in English as a second language, even if the emphasis on several communication modes may cause learners to lose sight of mastering any one ability.

In accord with Bauman and Murray (2010), using technology to provide captioning or transcription services, facilitating access, and encouraging good attitudes toward language diversity in the classroom are all part of TCA as a visually oriented teaching technique. Atar et al. (2021) explain that, the increasing usage of smartphones, applications, and the internet has made learning English comparatively simple. Since it includes all types of multimedia representations, deaf learners are considered to be able to flexibly optimise their learning abilities.

The capacity to employ a signing system and the availability of resources are not the only aspects of TCA. As stated by Waldo et al. (1981), it is about making sure that people have consistent and persistent opportunities to interact and acquire knowledge. This suggests that this method supports learners for whom English is a second language as well as those with linguistic disabilities. It does, however, require some effort and time to understand and incorporate this technique into regular practice as well as to either create or locate materials. TCA may lessen unnecessary cognitive burden (De Leon, 2020), allowing learners to comprehend proper writing skills while writing in English as a second language.

In this regard, De Leon (2020) asserts that TCA is an accessible multimedia learning technique that matches the needs of individual deaf learners to optimise talents, minimise impairments, and facilitate communication. Since language and communication are crucial to human interaction and enable people to express their ideas, feelings, and thoughts as well as understand and relate to others, it can be said that TCA is a "catch-all" method (Musyoka et al., 2016) that ensures deaf learners' access to language through an accessible method that accommodates all levels of hearing loss (Dubin,2023). However, given its potential for extreme individualisation, there may be a lack of standardised best practices and inconsistent teaching strategies.

Due to deaf learners' dearth of exposure to spoken language, they can benefit from visual linguistic input across a variety of modalities to assist in the development of their second language (Marschark et al. 2016). With all of its modalities, TCA has the potential to improve the word recognition, reading comprehension, and finger spelling skills of the deaf. Specifically, research by Karchmer & Sparks (2010) found that deaf learners who received TCA achieved more in literacy than those who received instruction in signed language. In this instance, TCA, which includes sign language, assisted in establishing rich linguistic settings that promote the growth of deaf learners' expressive and receptive language skills (Gallaudet University, 2019). According to McTee et al. (2019), visual support that is freely accessible to all learners can minimize distractions by giving clear and succinct information.

As claimed by Kauffman & Marentette (2013), TCA enhances deaf learners' social and emotional development. Additionally, this study showed how it contributed to the development of more supportive and inclusive learning environments, particularly for learners who have emotional and social difficulties in the classroom. To accommodate the various learning preferences and styles of deaf learners, teachers incorporate TCA into their English language instruction. Given this, TCA appears to be an engaging approach that lowers the emotional barriers that deaf ESL learners face. However, Light & McNaughton (2014) clarify that using many communication modalities simultaneously may lead to fragmented language intake, which might obstruct the development of literacy (especially one related to building vocabulary) and higher-level skills.

To emphasise vocabulary and grammatical ideas in English language learning, for example, teachers might employ visual cues and demonstrations (Marschark & Houser, 2012; Schick, Williams, & Kupermintz, 2006). Similar findings were reported in a study conducted in 2016 by Drouin et al., which demonstrated that TCA through story-telling improved deaf learners' comprehension and expressive abilities. In other words, Anita et al. (2012) explain that TCA promotes collaborative activities to promote peer interaction and language practice, deaf people can therefore engage in narratives visually and expressively when they can express themselves in any comfortable way that suits their needs.

According to Purwowibowo & Hendjintato (2018), TCA that uses certain social media text and visuals can assist deaf young learners in mastering language and communication. In terms of learning English nouns, verbs, adverbs, and any other words, teachers let the deaf identify both the visuals and the words or phrases that describe them can be used with pictures. In this way, deaf and normal children are equally capable of picking up the language through multiple communication modalities. However, as TCA emphasises writing, it is necessary to give the deaf learners more opportunity to acquire vocabulary and its meanings in the teaching and learning process.

In conclusion, the Lesotho CAP (2008) and the Lesotho Ministry of Education assert that teaching and assessment should take individual learners varied educational requirements into account. TCA therefore helps consider this mandate by supporting diversity, accessibility, and equal opportunity in education (Beal, 2015) and attends to the linguistic and communicative needs of deaf learners (Musselman et al., 2017). Encouraging inclusive education through TCA, which guarantees equitable access to high-quality education for all deaf learners regardless of age or gender, to improve reading skills, is in line with Strategic Development Goal 4: Quality education.

Contrary to the statement above, deaf learners' language development is significantly influenced by the age at which they start learning English. This aligns with the findings of Mphatsoane et al. (2023) that the creation of inclusive and accessible educational platforms is aided by an understanding of the influence of age. Early exposure to TCA can therefore help young deaf learners achieve bilingual fluency in both their mother tongue and English.

Studies reveal that TCA may be used with deaf learners of all ages, but teachers must modify their communication techniques to accommodate their learners' evolving needs (Marconi, 2016). For instance, visual tools may benefit deaf learners in preschool (2–5) by exposing them to a continuous language-rich environment that incorporates sign language, speech, and other visual or auditory supports; for deaf learners in school (6–18), it may improve their access to information, encourage peer interaction, and ultimately support academic success (raisingchildren.net.au, 2023). This supports the argument made by Kholis & Purwowiwobo (2020) that to support language development, TCA should be different for each learner and adjust to meet their specific learning needs, hence the incorporation of several visual tools.

In particular, it has been observed that visual teaching aids, which are a component of TCA, are more effective in helping younger deaf learners (years 5-8) acquire new words (National Deaf Children’s Society, nd.) and improve their vocabulary than older learners (ages 9–12) (Dostal &

Wolbers, 2014). In addition, they improved younger deaf learners' overall writing skills in the research conducted by Musselman et al. (2017). Given TCA's flexibility and comprehensiveness, this may suggest that young deaf learners are more likely to be able to seamlessly transition between various communication modes and develop writing skills at the same time (De Leon, 2020).

Further, the above differences may also be due to the fact that older deaf learners may have already established preferences for various levels of proficiency in writing English language or have preferences for particular modalities of communication (Alanzi, 2021; Mayer & Trezek, 2023). Teachers dealing with these learners across age groups must thus, take individual variances in linguistic background into account and adjust their teaching strategies accordingly.

Despite this, Andrews et al. (2016) hypothesised that gender could also have an impact on TCA's efficacy. According to this study, girls outperformed boys in terms of writing skills. Boys gained more from the use of sign language in TCA, according to a different study by Knoors & Marscharck (2012), whereas females did better when speech was included. This suggests that when implementing different communication modalities in a classroom context, gender should be taken into consideration. To better help male and female deaf learners in their literacy development, further research is needed to comprehend the processes behind these variances and to develop practical interventions.

2.3 Conclusion

The chapter provided literature on study. It provided theoretical framework of the three incorporated theories on study: Person Environment Fit Theory, Cognitive Theory of Multimedia Learning and Legitimation Code Theory. Thereafter, characteristics that I wanted to study were provided within a conceptual framework. Lastly, the reviewed literature was centred around English language learning for Deaf learners, comprising of how language acquisition is for them, the misconceptions about their English language learning, the educational interventions and TCA. The following chapter provides the methodology undertaken on study.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

The methodology adopted in the current study investigated and employed TCA to develop deaf learners' writing skills in English as a Second Language. The philosophical lenses of the study, research approach, and research design commence this section. Following these, are the scope of the study, sample and sampling technique, and data generation tools which are also described in detail. Data generation procedure, methods of data analysis, methodological challenges, and summary are the latter stages of this chapter.

3.1 Paradigm

A paradigm is a way of thinking that incorporates a number of presumptions and beliefs (Neuman, 2011). Paradigms are "a fundamental set of beliefs that guide action" (Guba, 1990, p. 17). This means that, methodology, ontology, and epistemology make up every paradigm. Thus, using paradigms in research gives scholars a thorough grasp of a subject from the perspective of the three mentioned components. For instance, a search for a philosophy that justifies the blending of quantitative and qualitative approaches in a single study has coincided with the rise of mixed-method research (Barnes, 2019; Hall, 2013). As such, several ways exist to address this conundrum: the single paradigm method, the multiple paradigm approach, and the paradigmatic stance. As a result, the present study used a single paradigm approach—pragmatism—to provide the philosophical viewpoint. It is explained in more depth below.

3.1.1Pragmatism

A philosophical framework dubbed pragmatics emphasises practicality, problem-solving, and the application of knowledge (Morgan, 2007). It draws on the writings of Dewey, Mead, Peirce, and James (Cherryholmes, 1992). Indeed, it highlights the value of developing viable solutions to problems that arise in the actual world and stresses the application of empirical data and experimentation to guide decision-making. Pragmatism, as further explained by Creswell (2014), Hall (2013), and Shannon-Baker (2016), is centered on finding a practical solution to a problem rather than making generalisations about the breadth of knowledge. Put differently, pragmatism is thought to guide action-oriented research techniques in the current study, which aimed to uncover answers through the use of qualitative and quantitative methodologies to improve deaf learners' writing skills.

According to Cherryholmes (1992), pragmatism is fuelled by the belief that there is an outside reality that exists independently of our thoughts, a version to telling stories, and expected outcomes. This is because there is never an exact truth, which means that study findings are inherently flawed and incomplete. Consequently, pragmatism directs the researchers to show that a theory cannot be proven; rather indicates a failure to reject it (Philips and Burbles, 2000). This paradigm is not restricted to any one philosophical discipline; rather, it applies directly to mixed approaches concerning investigation, making extensive use of both quantitative and qualitative presumptions grounded on ontological, epistemological, and methodological positions.

Firstly, pragmatic reality is intersubjective, which means that it is concurrently objective and subjective (Morgan, 2007). This suggests that it recognises the existence of one reality in addition to the various ways in which it might be interpreted. For instance, in the current study, the researcher employed qualitative methods to assist in gathering data that was analysed to obtain a thorough understanding of the phenomena and created hypotheses that were assessed through the application of a quantitative technique (Maarouf, 2019).

To quantify the accuracy of reality, the researchers employed a quantitative approach that involved tests, but they also adopted a specific reality viewpoint on the writing abilities of deaf ESL learners. In this case, the truth is what functions, and that is what the researcher aimed to discover. However, Morgan (2007) argues that pragmatism still lacks a cogent ontological perspective that clarifies how a pragmatic researcher may choose among two opposed ontological stances to achieve research goals. It is worth noting that the way social actors behave is shaped by their interpretation of reality, which modifies the circumstances and the results.

Secondly, pragmatists believe that to create realities, one will occasionally be required to adopt an objective approach that minimises subject interaction (Teddlie & Tashakkorie, 2009). It is generally concurred that it considers double-faced knowledge, implying that knowledge in general may be seen as being observable or unobservable, depending on one's ontological position. For example, it comprises every aspect of the social, cultural, and environmental factors of deaf ESL learners' construction of writing skills. In the teaching and learning of writing skills, deaf ESL learners learnt from different sources of knowledge such as social interactions with others in a language-rich environment. This is consistent with Maarouf's (2019) assertion that pragmatism embraces knowledge from all sources through the use of the appropriate kind of methodology to support the achievement of research objectives. It is thought to provide knowledge that directly relates to real-world occurrences, increasing the likelihood that practice and interventions will be informed through it.

Thirdly, since pragmatism has previously been shown to be primarily interested in "what works" and problem-solving strategies (Patton, 1990), instead of focusing on methodologies, the researcher has to highlight the research topic and make use of all possible ways to comprehend the challenge. To improve the writing abilities of deaf learners, researchers used several methods such as qualitative DA, FGDs, and quantitative standardised tests of TOWL. These methods demonstrate how to apply what is effective.

This is consistent with pragmatism's tenet that emphasises flexibility in research approaches. According to Hathcoat & Meixner (2017), this flexibility is evident in study designs that researchers modify in response to new information or evolving circumstances. Consequently, improving the research process's responsiveness. This practical triangulation thus improved study validity and reliability, which further aided in refuting patterns and themes, reducing bias and in turn boosting trust in the findings and results.

Furthermore, pragmaticism enables the combination of qualitative and quantitative methodologies as aforementioned, allowing researchers to hone in on actual outcomes that directly affect the development of deaf ESL learners' writing abilities. The validity of an idea's meaning may be ascertained by considering all of its practical ramifications, as opposed to just the extent to which it corresponds to an abstract reality, attributable to its capacity to highlight the practical implications of ideas, theories, and actions (Dieronitoll, 2014). Pragmatics centre their decisions on what and how to investigate the desired outcomes. According to (Morgan, 2007), pragmatists reject the idea that there is a single, unchanging reality. This is comparable to mixed methods, which consider a variety of techniques for gathering and analysing data instead of limiting oneself to one method.

Ultimately, pragmatism allows for a variety of approaches, perspectives, presumptions, and techniques for gathering and analysing data (Biddle & Schafft, 2015). Thus, by aiding in the examination of all factors that contribute to effective communication and learning for deaf ESL learners, it helped synchronise the Person-Environment Fit Theory, Legitimation Code Theory, and Cognitive Theory of Multimedia Learning. Meanwhile. (pragmaticism) enabled the exploration of both subjective experiences and objective measurements, providing a holistic view of what is being researched. All of these contribute to understanding the particular difficulties deaf learners have in learning to write, which in turn informs the creation of efficient intervention and resources (TCA) to enhance their learning.

3.2 Mixed-Method Research approach

Qualitative and quantitative research were viewed as two competing paradigms in the 1970s and 1980s. Over the past 20 years, studies from both camps have started to recognise the value of each set of data that was gathered using the two different approaches. Mixed-method research was first established during this period. The growing complexity of research problems and the need for a wide but thorough understanding made possible by qualitative and quantitative data, respectively, were undoubtedly what spurred attention (Mitchel, 2018). Thus, it is said that using a mixed-method research technique overcomes the drawbacks of using a monomethod approach (Creswell et al., 2003; Greene & Caracelli, 1997; Johnson & Onwelegbuzie, 2003; Teddlie & Tashakkori, 2009; Johnson & Turner, 2003), specifically when the research displays variables with both qualitative and quantitative characteristics.

Additionally, to have a more thorough understanding of a study subject, a mixed-method approach to research includes gathering, analysing, and interpreting both qualitative and quantitative data (Creswell & Plano, 2007). It enabled me to investigate many facets of deaf ESL learners' writing challenges, offering a more comprehensive and intricate viewpoint through the incorporation of TCA.

Consistently, mixed approaches may involve diverse integration strategies for the qualitative and quantitative data. For example, sequential data collection entails collecting one type of data first, followed by the collection and analysis of another, and transformative data collection uses one type of data to inform the collection and analysis of another (Molina-Arzorin, 2016). Simultaneous gathering of qualitative and quantitative data is known as concurrent data collection (ibid).

However, Creswell & Creswell (2018) propound that, by utilising the advantages of other perspectives, a mixed-method approach enables researchers to get beyond the drawbacks of each specific technique. For instance, whereas quantitative research allows researchers to extrapolate findings to broader groups, qualitative research strives to offer rich, specific data insights into experiences, attitudes, and motivations. It seems reasonable to believe that the mixed method approach gives the results more validity.

This restriction also applies to its capacity to alleviate the inadequacies of quantitative research, such as reductive research models that might omit crucial constructs that can be found by utilising qualitative methodologies in theory formation (Glogowska, 2011). Notwithstanding this, it may also overcome qualitative shortcomings like the impact of the researchers' prejudices on their results interpretations (Fetters & Molina-Azorin, 2017b). Overall, the mixed method approach may be used to validate and evaluate the findings of qualitative data, and it can validate and provide explanation for quantitative data. This improves validity and reliability by triangulating data from several sources, hence promoting trust in results drawn from two methods.

The basic tenet of mixed methods research is that integrating both qualitative and quantitative findings results in a comprehensive understanding of the study subject, according to Creswell (2014) and Molina-Azorin (2016). This is because certain research problems cannot be sufficiently addressed by a single methodology. However, there is a chance that the two techniques might conflict or be biased, thus researchers need to be conscious of their prejudices and make sure that integrating several methodologies does not jeopardise the integrity of their work.

In light of the aforementioned assertion, "quantitative and qualitative research approaches are not only compatible but also complementary" claims Mitchell (2018, p. 104). To be explicit, this was observed in the current research, where quantitative assessments of deaf ESL learners' performance were incorporated with qualitative observations of classroom activities to provide a broad understanding of TCA as a teaching strategy.

In summary, the use of a mixed method in this study was prompted by its connection to the pragmatism paradigm, which emphasises practical outcomes. While pragmatism values knowledge that is applicable and useful in real-world contexts (Creswell, 2014), emphasising the importance of actionable findings, the mixed method seeks to provide an understanding of complex phenomena that can inform practical interventions (Johnson and Onwuegbuzie, 2003).

3.2.1 Embedded Design

When either qualitative or quantitative procedures are inadequate to comprehend the study topic fully, or when both methods offer advantages, different mixed methods designs might be helpful (Creswell & Plano, 2007). The current study sought to embed the qualitative findings with quantitative results to address each research question, therefore Embedded mixed method research design was used.

Embedded design acknowledges that both quantitative and qualitative data are needed to answer each research question. Quantitative data can incorporate, overlay, or enhance qualitative data (Cohen et al., 2018; Dawadi et al., 2012). Data of one kind typically takes precedence over data of another type. The widely used embedded design notations are introduced by Creswell & Plano (2007). QUAL (qualitative data has priority over quantitative data), Quan (qualitative data which are subordinate to qualitative data), and Qual (qualitative data which are subservient to quantitative data) are the four possible outcomes. As a result, the present study used QUAL, which means that quantitative elements were used alongside mostly qualitative data in a secondary or supplementary manner.

In consistent with the above, in order to answer research question one, I investigated the difficulties deaf ESL learners have when writing in ESL through DA. I then went on to elucidate these difficulties by conducting a pre-test; in other words, the quantitative aspects of pre-test scores complemented the qualitative findings. Cohen et al. (2018) clarify that it is crucial to choose when and how to collect data, either concurrently or sequentially. Accordingly, in this study, I generated data sequentially for the three research questions.

Specifically, I produced qualitative data first, followed by quantitative data. Furthermore, because the design of Participatory Action Research and Embedded Mixed-Method Research complement each other (see section 3.4.1), the latter was employed. This approach's iterative cycles complement the flexibility of embedded mixed methods, and researchers can use it to enhance their findings within a participatory action research framework (T W Mataka, 29 July 2024, personal communication). As new insights from qualitative findings emerged during the first cycle of PAR, I was able to modify their quantitative measures accordingly for the following cycle, thereby embedding the findings.

To sum up, I employed the Embedded mixed method design in order to concentrate on the qualitative data while also comprehending how the quantitative data contributed to the understanding of the qualitative data (Yu, 2017). I used focus group discussions and in-depth interviews to investigate the communication modalities to use in TCA for the second research question. Structured observation was then used to explain the results. Essentially, the quantitative aspects of structured observation involved the analysis of numerical data, whereas the qualitative findings aimed to investigate the communication modalities of the participants.

3.3 Research Design

Researchers should explain how the data generation process will be planned in accordance with the chosen research approach in addition to choosing a research approach (Creswell & Creswell, 2023). This is referred to as research design, which Khalema (2023) defines as the set of guidelines used to generate data. Cohen et al. (2018), on the other hand, define a research design as a framework and strategy for approaching, operationalising, and examining the research problem or issue. It lays out the theories, approaches, and methodologies to be used, the kinds of data that are needed, how and from whom they will be collected, and the methods for analysing, interpreting, and reporting the data (Creswell & Creswell, 2023). Thus, the design for the current Embedded Mixed-Method research is Participatory Action Research and it is described in detail below.

3.3.1 Participatory Action Research

Participatory Action Research (PAR) is a spiral type of study design that, according to Nelson (2014), begins with the planning, action, observation, and reflection stages and reflects the performance of self-reflection coils. Through problem-solving in real-world scenarios and working with study participants to comprehend societal concerns and implement change, this spiral activity seeks to increase the efficacy and efficiency of ordinary work.

Furthermore, PAR involves participants in the study process through a collaborative, self-inquiry method (de Vos et al., 2021; McNicoll, 1999). Its emphasis is more clearly seen in the co-creation and co-learning of information between the participants and the researcher. In other words, the goal was to enhance writing abilities by group practice that combined reflection with an action-oriented approach. All of these were carried out using the Kemmis & McTaggart (1988) recommended stages of action research: planning, acting, observing, and reflecting. Throughout the research process, its cyclical nature allowed for ongoing input and adaptation. I was able to iteratively enhance my teaching approach based on evidence gained throughout the cycle, with each stage playing a significant role in the overall process.

3.3.1.1 The stages of PAR

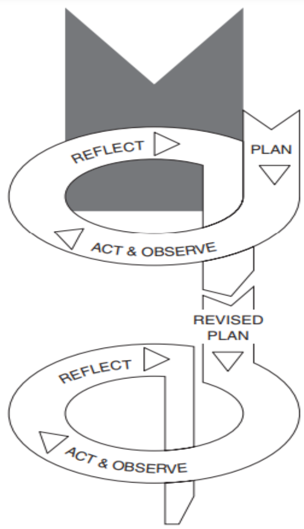

Figure 3. Action plan circle extracted from Kemmis & McTaggart (2005, p. 595)

First, as noted by Kemmis & McTaggart (1988), during the planning stage, the researcher identifies a problem, gathers preliminary data to comprehend the context and scope of the problem, and then develops a detailed strategy to outline how to implement the changes. Moons (1996) further adds that during this stage, the researcher first articulates what they want to change or improve, sets clear goals, and then develops a detailed strategy to outline how to implement the changes. This is where I laid the groundwork for later actions, like planning how and which strategies I use to develop the various writing skills of deaf ESL learners and making sure that efforts are directed toward meeting the needs of deaf learners in ESL.

Second, the methods from the preceding steps are put into practice during the acting stage (Baldwin, 2012). Here is where I implemented the strategies I had planned to utilise to help deaf ESL learners improve their writing abilities. Using instructional techniques to meet the objectives established during the planning phase was one of them. According to Carr & Kemmis (1986), data is gathered at this stage using a variety of techniques to track developments on the efficacy of the changes that have been put into place. For instance, I assessed the success of the intended techniques and the development of the writing skills of deaf ESL learners using structured observations and the "evaluation" part of my lesson plans.

Thirdly, according to Kemmis & McTaggart (1988), the third stage is the observing stage, which is centered on methodically gathering and analysing data pertaining to activities made during the acting phase. I observed and recorded both the intended and unexpected effects of my instruction, as suggested by Bedford (2022). I was able to record and examine my actions from the "evaluation" phase to determine whether the objectives were met and what effect the use of specific modalities in teaching and learning writing had on them because the study is embedded in mixed-method research. Through analysis, it was possible to determine what did and did not function well, which provided useful information for the following cycle.

According to Baldwin (2012), the final step is the reflecting stage, which entails considering the methods and results of the entire study. It is further explained that the data generated during the observation stage is used by the researchers to assess whether their practices produced the desired results. Consequently, I reviewed the initial plans, created new ones for the ensuing cycles, and identified lessons learned by emphasising effective strategies and areas that required improvement. It seems plausible to believe that this phase functioned as a link between the two research cycles, enabling me to draw lessons from my mistakes and improve my methods over time.

3.3.1.2 The Phases of PAR

Although it has four phases, only two were used in this study: the diagnostic and transformative phases. It is important to note that the data generation tools used to diagnose the problem should be the same tools that are used in the transformation phase to effectively tell the effectiveness of the intervention (M. Makumane, 19 July 2024, personal communication). In this case, for the first research question, I used qualitative DA and the TOWL pre-test to identify the difficulties deaf learners faced when writing. To determine the communication modalities that should be used in TCA to enhance the writing abilities of deaf learners, the second research question successively embedded quantitative structured observations with qualitative FGDs and in-depth interviews.

In the Transformative phase, this is where I implemented the solutions and saw how the transformation happens (Thamae, 2023). Similar to the diagnostic phase, the same tools used to diagnose the problem deaf ESL learners were faced with in writing in ESL were used to find the effectiveness of TCA as an intervention. This is where I incorporated the identified modalities to address the challenges identified in the diagnostic phase, and thereafter evaluate the effectiveness of TCA on deaf learners' writing skills.

3.4 The Scope of the Study

As with other countries, Lesotho is no exception, English language was declared a medium of instruction from grade 4 upwards (CAP, 2009), implying that the majority of Lesotho primary schools use English as an instructional language from grade 4, and that includes those primary schools that have deaf learners. Additionally, this country has few schools that accommodate deaf learners, not to mention there are only two deaf schools in Lesotho (Russell, 2020). Resultantly, it is critical to develop strategies to improve deaf learners' English language writing skills (Beal, 2015). Thus, TCA as a teaching strategy that comprises all means of communication modalities (Anita et al., 2012) was incorporated in the current study to inform the teaching of writing skills of deaf ESL learners.

Accordingly, the current study was conducted in one primary school in Leribe, Lesotho, where English is taught and learned as a subject in grade 7. This research site was the side inside the population of all deaf learners in Lesotho. The standardised Test of Hammil and Larsen's Test of Written Language was thereafter administered before and after the implementation of TCA through an Embedded Mixed-Method design. Gay et al. (2011) underscore the importance of researchers defining the scope of their study, including variables such as location, time frame, and issues that will be addressed.

The identities of the participants and the school remained anonymous to maintain confidentiality. The participants were believed to be the best sources of information. The participants were the researcher, deaf ESL learners, and their English language teachers. Nonetheless, Burdens and Abbot (2011) clarify that time and money constraints might prevent the researcher from conducting the study. For 8 weeks, attendance at a single school was affordable.

3.5 Sample and sample size

3.5.1 Sample

In this mixed-method research, the target population of this study is defined to include primary school deaf learners between the ages of 12 to 21 in Lesotho to eliminate the challenges they face in the ESL classroom when writing. Lesotho has several schools with deaf learners, and the accessible portion of the learners, that was within my reach was that one inclusive school in Leribe. According to Nworgu (1991), the portion of the population that is studied is called the sample of the population. Thus, this research site is the sample inside the population of all deaf learners in Lesotho.

3.5. 2 Sample Size

The findings from 30 deaf learners were used to generalise to the main population because the selected learners have characteristics that represent the whole population (Kruskal & Masteller, 1979; Collins, 2017). According to Cohen et al. (2018) this is the sample size. The integration of qualitative and quantitative procedures might make it difficult to determine the right sample size for mixed-methods research. Nolan et al. (2013) clarify that sample sizes for qualitative research are often lower than those for quantitative research. Thus, the sample size for the current mixed-method research was determined mostly by the research's objectives, methodology, and hypotheses (Onwuegbuzie & Collins, 2007). It is said that although this may be considered a small sample, small samples might be used in exploring quantitative research studies.

In situations when there are several variables and accurate assessments of the dependent variables are not available, Borg & Gall (1979) clarify that a larger sample size is necessary. To substantiate this, it is apparent that determining sample size involves a careful balance between methodological rigour and practical limitations (Nanjundeswaraswamy & Divakara, 2021). It appears when determining the appropriate sample size for a mixed method, several key variables need to be considered and described to ensure accuracy and reliability in analysing data. Therefore, the variables used in the study are described in detail in the table below:

Independent variables	Moderating variables	Dependent variables

-	Total Communication Approach	Age- 12-16 -17-21 Gender- Boys -Girls	Deaf ESL learners' writing skills

Table 1. Variables used in the Study

As evident above, TCA was an independent variable in the current study. An independent variable is defined as one that is measured and subject to manipulation (Creswell, 2014; Macleod, 2023). Since the goal of TCA as an instructional approach was to result in an outcome, it follows that it was assumed to influence the dependent variable, which in this study was the writing skills of deaf ESL learners. Nonetheless, according to Cohen et al. (2018), the dependent variable is measured and seen to evaluate the impact of the independent variable.

In moderating variables, the link between the independent and dependent variables is predicted to be either stronger or weaker, depending on the age and gender of deaf ESL learners. It was anticipated that age and gender would either increase or decrease TCA's efficacy as an independent variable. Moreover, they are the processes by which modifications to one variable result in modifications to another (Bhandari, 2023). In essence, the age and gender of deaf ESL learners influenced the efficiency of TCA in either improving or decreasing their writing skills.

3.6 Sampling criteria

In accord with Cohen et al. (2018), the competence of a study is determined by the applicability of its sampling strategy, instruments, and methodology. Selecting an area, fragment, or section that serves as a representative sample is the process of sampling (Onwuegbuzie & Collins, 2007). This procedure contributes to the quality of the conclusions the researcher draws from the underlying data. For instance, selecting the appropriate sample size and methodology are crucial factors in both qualitative and quantitative research. However, it appears that sampling is significantly more difficult in mixed methods as the sample schemes for the two methodological components must be constructed.

Despite the aforementioned, the study's purposive sample selection method enabled the deliberate selection of a group that offered thorough insights into both the quantitative and qualitative elements of the research (Bisht, 2024). This is because the deaf ESL learners employed in the study's quantitative component are the same ones who were used in its qualitative phase.

3.6.1 Purposive Sampling

The purposive sampling technique was used to guarantee that the chosen participants reflected the range of viewpoints pertinent to the research (Etikan et al., 2016). There is a possibility of bias in the data generation process due to the selection process' apparent subjectivity. As a result, while choosing participants, researchers must exercise caution to avoid inadvertently introducing bias based on subject judgment. This suggests that, regardless of the reason for their deafness, the researcher chose all deaf learners in grade 7. For example, even individuals with mental retardation and hearing impairments were also included in the sample.

However, generalising results from a purposively selected sample from a larger population may be constrained because of the non-random nature of this sample (Etikan, 2016; Nikolopoulou, 2022). Collins (2018) claim that while evaluating and discussing the results, researchers should be very explicit about these constraints. Therefore, by carefully analysing, synthesising, and acknowledging data from different sources to derive relevant findings that reflect both elements of the study, the researcher decreased the complexity of integrating two samples.

In light of the aforementioned claim, the present mixed technique used purposive sampling to choose the sample. Selectivity based on non-probability sampling was achieved when a researcher focused on a particular group with certain characteristics in studies with small samples. As a result, the researcher selected the deaf seven ESL graders based on their perceived typicality and unique qualities as deaf English language learners. These learners had a wealth of knowledge on the research questions (Leedy & Omrod, 2013).

Additionally, purposive sampling is also used to focus on comparisons of distinct problems and situations. Based on the particular demands of deaf learners, statistical processes statistically justified this comparison. It met the goals of the researcher, but it is purposefully and shamelessly selective and prejudiced; it made no pretense of representing the population as a whole (Cohen et al., 2018). As a result, to avert such, a researcher should precisely specify the selection criteria and confirm the selections by explicitly identifying the traits and attributes that are crucial for research questions.

3.7 Instruments

The documents used in the study were purposively selected to address questions and hypotheses and were varied to eliminate threats to internal validity. The instruments used were DA, observations, FGDs, and tests. They are described in detail below:

3.7.1 Document analysis

Document analysis (DA) is valued for its ability to collect data efficiently due to the controllable nature of documents as practical resources. According to Bowen (2009), documents are reliable, non-reactive data sources that are unaffected by the researcher's method or impact and may be read and examined several times. Thus, DA on learners' exercise books, was done to answer the first study question. These materials provide researcher with a thorough knowledge of the learners' current writing abilities.

When analysing these documents—which might be primary or secondary—content is tagged into themes (O'Leary, 2014). To determine each learner's current level of writing, a portfolio assessment was conducted. Portfolio assessment is the collection of samples of learners’ work overtime to evaluate their progress (Gabuyo, Yonardo & Gary, 2017), as it is mandatory for teachers to “assess learners’ progress continuously; conduct remedial lessons, and keep records of learners’ portfolios” (MoET, 2019, p.35). Thus, to assess the deaf ESL learners’ challenges in writing in ESL, researcher requested for their past exercise books. These previous exercise books written by deaf learners were thought to be pertinent and rich in content (Cohen et al., 2018) to address the first research question.

Additionally, given that DA is a qualitative data-collection strategy that entails assessing both physical and electronic documents to comprehend and expand upon the information they offer (ibid), these exercise books also included background material and a wide range of data, which helped to contextualise the study. This is due to the fact that the information included in those exercises as documents is no longer observable and the information may not be sufficient to draw conclusions about learners’ current writing skills. The information in them already exists, hence was complemented by TOWL pre-tests scores for a more nuanced, robust and reliable understanding of deaf ESL learners' current level of writing.

These documents were seen as respondents (Cohen et al., 2018) based on the degree of writing proficiency of the deaf ESL learners. Questions were posed, and the response were highlighted within the text, while the other were accomplished by measuring the use of certain words, phrases, and concepts and tracking their occurrences. For example, the researcher noted the words that learners struggled with most when it came to spelling while assessing their writing proficiency. The researcher thus determined deaf ESL learners' limited writing of words with three syllables for instance.

3.7.2 Focus Group Discussions (FGD)

FGDs are discussions lead by a facilitator with a small number of participants who are experts in the field or have a keen interest in a certain subject (Hennink & Leavy, 2014; Krueger, 1988; Morgan, 1988). Moreover, they revolve around a concise set of leading inquiries intended to elicit detailed information. The researcher thus conducted focus group discussions (FGDs) with the deaf ESL learners to determine the strategies to use through TCA to improve their writing abilities because they are thought to possess specialised expertise. Following a set of guidelines, the researcher in this instance gathers comprehensive information on the language and communication background of deaf learners to inform the development of instructional strategies. Notably, considering the language and communication background of deaf ESL learners is crucial in understanding their language background, communication preferences, cultural considerations, educational history, and individualised instructions. All these are critical in determining the strategies to employ.

As stated by Intrac for Civil Society, USAID (2011), FDGs are qualitative instruments that are used to provide direct quotes that might reflect the opinions of the relevant group or qualitative insights. Nyumba et al. (2018) delineate that, the process consists of six steps: selecting a team to lead the discussion, identifying groups and participants, choosing a time and place, creating a set of questions or a discussion guide, leading and recording the discussion, and analysing the data that is generated. As such, the researcher conducted them on groups of deaf ESL learners prior to the start of the intervention in their classroom.

In these discussions, the researcher used a discussion guide to facilitate these discussions and meticulously documented each deaf learner's answer in their groups. She then analysed the collected data to identify potential strategies for instruction that might be implemented through TCA to help the learners improve their writing abilities. Specifically, the FGDs ensured that all of their opinions and experiences were considered when decisions about instructional strategies were being made (Nyumba et al, 2018; Steward & Shamdasani, 1990). Their capacity to support researchers in delving further into the viewpoints and insights of the deaf was invaluable in figuring out the particular difficulties they had in the classroom and the best teaching techniques catered to their particular needs. That is, delving deep into one’s preferred mode of communication helped create a conducive learning environment that maximised their engagement and participation their learning of writing in ESL.

Furthermore, the FGDs are often employed to obtain the opinions of people who cannot speak in front of a bigger group or at group meetings. These persons often include women, children, and people with disabilities, as well as other minority or disadvantaged groups (Humans of Data, 2017). This is because FGDs facilitate the development of a rapport with the deaf, fostering a supportive environment in which they feel free to express their opinions. As a result, the researcher improved a culturally sensitive method in the FGDs to comprehend the cultural backgrounds and communication preferences of deaf learners (Mishra, 2016). All of these were necessary to determine whether strategies were applicable and successful in helping them advance their writing abilities in English, which is their second language.

Considering the complexity of the sample as in the current study of 30 deaf ESL learners with varying needs, including some who are mentally retarded, the researcher divided them into smaller groups. This was to enhance effective communication and engagement (Humans of Data, 2017). Thus, the learners were divided into 5 groups, 5 per group to allow personalised attention from the researcher and meaningful interaction among deaf ESL learners while also accommodating their unique needs. Given that deaf culture is rich and diverse (Higgings & Lieberman, 2016), with its own norms, values, and traditions (Marks, 2020), FGDs allowed me to understand the cultural background of deaf ESL, thus incorporating culturally relevant strategies to develop their writing accordingly.

In summary, FGDs can be employed at any point in the research or program cycle, per Morgan (1988). They can be used to help shape a project during the design or planning stage (Steward & Shamdasani, 1990), as was the case in the study's initial stages. This helped the researcher better understand deaf culture, as previously mentioned, and identify TCA strategies to employ prior to the start of an intervention. The interactive element of FGDs encourages open discussion (Nyumba et al., 2018) among the deaf, allowing them to learn more about me as the researcher in addition to building on the views, ideas and experiences of others.

3.7.3 Structured Observations

In research, when describing a phenomenon's attributes based on an observer's subjective interpretation of what they see, observations are a useful method for gathering data in research (George, 2023). This suggests that studies employ observations to capture the subjectivity and complexity of human behaviour, including attitudes, perceptions, perspectives, and cultural practices. All these may not be quantifiable or measurable through other data generation methods. As a result, the present study made use of participatory structured observations to evaluate how the researcher integrated TCA into the instruction of writing skills and pinpoint the strategies that teachers deployed.

Regardless of the kind of observation, all are frequently employed in conjunction with other research tools through triangulation (George, 2023), since they may be biased on the researcher's viewpoint. Referring to them as structured participatory observations in this instance, I also used them in conjunction with the DA and post-tests to assess the efficacy of TCA as an intervention. In this instance, the same structured methods I employed to assess my writing were also applied to the observation of deaf ESL teachers teaching writing. This is because they typically yield the most direct data about the process of teaching.

First, Weade & Evertson (1991, p. 37) characterise structured classroom observations as a "systematic, intentional action"—that is, a deliberate, intentional, and often formalised method for obtaining data—and as a complex phenomenon with a variety of interrelated components (Jain, 2023). In light of this, several elements ought to be encapsulated by the following: Who will be observing whom, when, doing what, where, under what conditions, for what goals, with what devices or tools, and what is the desired result. For example, the researcher observed the deaf learners' English language teacher while they taught writing skills to determine the strategies they employed. I brought a checklist to record everything that happened, including the methods the English language teachers used to teach the deaf learners how to write.

Furthermore, Brinko (1993) and Weade & Evertson (1991) emphasise how crucial it is to have a clear focal point for the observation process. This need not only restrict what is observed, but in the absence of a directing emphasis, the observer will only be able to compile haphazard impressions, which will make it challenging to compare, contrast, or aggregate in any meaningful way (Smit & Onwuegbuzie, 2018). The researcher thus focused on the ways that teachers employ to teach writing, how they evaluated their own implementation of those strategies, how they engaged with their learners, and how learners reacted to those strategies. The researcher was able to determine the strategies she could use to teach writing to deaf learners by using those focal topics.

To comprehensively document the range of behaviours and interactions that take place in the classroom, the researcher should not focus on the performance of teachers per se, but rather on the patterns of teaching and learning that are demonstrated through interactions between teachers and learners as well as through learners' engagement in response to learners' actions (Macdonald, 2016). Therefore, the focal points gave the researcher a broader perspective on how to approach the observation process, which improved her understanding of how teachers' strategies affected learners' learning. This allowed her to identify strategies that can be used with TCA to help deaf learners improve their writing skills.

The term "narrative systems" refers to the recording of classroom activities and documentation of occurrences (Weade & Evertson, 1991). This allowed for the creation of written descriptions of actions that were more particular to the context and more detailed. They do, however, capture a wider range of events and may provide a more comprehensive account of what is being observed (Macdonald, 2016) because they are more open and do not have any present categories (Smit & Onwuegbuzie, 2016). As a result, it is apparent that they require a lot of work, hence pertinent when trying to fully comprehend a particular scenario.

Second, Weade & Evertson (1991) characterise the observer in participatory observation as the first instrument of observation since the process of observation is shaped by their frame of reference, which influences what is noted, documented, and/or evaluated. Using guided categories to concentrate on, the researcher uses descriptive systems in this kind of observation as they observe target behaviours taking place in a natural setting (Macdonald, 2017).

The researcher, for example, assessed her use of TCA methods, her interactions with learners, the interactions between learners, the learning environment, and the knowledge legitimation in her teaching after each class to observe target behaviours (Dovetail Editorial Team, 2023). More precisely, these systems are not limited to counting or rating occurrences. As a result, the researcher carefully noted context-specific details and how context influenced behavior when documenting the incidents mentioned above. Admittedly, this type of observation may give researchers a unique way to better understand how people they are studying feel about a topic. Therefore, their role may influence group behaviour, hence ought to be extra careful to be a neutral participant (Dovetail Editorial Team, 2023).

Despite this, Vidmar (2006) suggests using "reflective peer coaching" in structured participatory observation to encourage self-reflection and self-awareness before, during, and after teaching. He explains in this model how the teacher meets with the peer coach colleague ahead of time to go over the activities and goals that are planned in addition to what should be considered evidence of successfully met learning outcomes. After that, they get together so the teacher may consider what transpired, why it happened, and particularly to consider any potentially important instances. To carry this out, the researcher met with the peer coach—a deaf English language teacher who is well-versed in the deaf culture—before and after her sessions to have discussions about her self-reflection.

It is worth noting that, in this observation, the English language deaf peer coach generally did not visit the classroom for observations, rather the structured participatory observation in the classroom was conducted by the researcher herself. In this instance, the peer coach's role was to assist the researcher in self-reflection so that a deeper understanding would be prompted, which in turn influenced practices going forward (Dovetail Editorial Team, 2023). The role of the deaf English language teacher prompted the researcher to engage in productive introspection.

3.7.4 In-depth interviews

Interviews with teachers who specialise in teaching deaf learners were conducted to investigate the strategies for teaching deaf pupils reading and writing skills through TCA. Gay et al. (2011) describes an interview as a qualitative data-generating technique in which two individuals converse; one asks a question, and the other responds. The aim of this is to gather data on a specific subject. Cohen et al. (2018, p. 506), define interviews as "a flexible tool for data collection, enabling multisensory channels: verbal and non-verbal, seen, spoken, heard, and written as in the case of the online interview". One can maintain control over this arrangement while still allowing room for spontaneity.

Additionally, as interviews vary in terms of their degree of structure, openness, and exploratory/hypothesis testing potential (Mears, 2012), the study used in-depth interviews because these methods enable the examination of issues, participant biographies, what matters to and is valued by the participants, what they know about a topic, and experiences (Newby, 2010, p. 243-244). Interviewing experienced teachers who worked with deaf learners yielded a wealth of information on successful teaching methods, obstacles encountered, and practices. The researcher then used the teachers' responses to analyse potential TCA strategies.

Engaging in open-ended conversations with teachers can facilitate the researcher's comprehension of the intricacies associated with aiding the deaf community's literacy development, ultimately leading to the identification of effective techniques. In support, Nolan et al. (2013) assert that in-depth interviews are usually carried out one-on-one, enabling the interviewer to comprehensively investigate complicated themes and go deeply into the interviewee's comments. With their flexible questioning, the researcher seemed to be able to modify the questions in response to the teachers' viewpoints, offering more nuanced insights into their approaches to teaching deaf learners. This, in turn, aided the researcher in selecting the best teaching strategies to apply in TCA based on the experiences and approaches of the teachers.

The purpose of the interview questions is to enable respondents to completely convey their experiences by generating thorough responses (Creswell, 2014). However, because of the in-depth and lengthy nature of this interview, obtaining authorisation and access might be challenging, not to mention that it might take some time to complete (Cohen et al., 2018). As a result, responders (teachers) who have firsthand experience working with deaf learners were given preference in the selection criteria for this kind of interview.

Without a doubt, it is crucial to respect standards of ethics and guarantee participants' informed consent, beneficence, and confidentiality when conducting this kind of interview. Kvale (1996, pp. 111–20) clarifies that each of the ethical questions raised should be thoroughly examined because they might all be problematic. Notably, to answer the second research question, in-depth interviews were employed in conjunction with learners' FGDs because they had the capacity to investigate topics, observe how and why people frame their ideas in particular ways, and determine the relationships between ideas, values, events, opinions, and behaviours that surveys are unable to generate (Cohen et al., 2018). As a result, allowing for the exploration of methods using TCA.

3.7.5 Tests

Researchers have a potent technique for gathering data in tests. A wide range of tests covering accomplishment, diagnosis, aptitude, proficiency, performance, and speed may concern collecting numerical data (Cohen et al., 2018). Therefore, the current study employed pre-tests and post-tests in transformative phase of action research (research question two). These tests are quantitative data generation tools that allow researchers to evaluate the effectiveness of treatment, determine the causal relationships between variables, and identify individual and group-level changes over time (Smith, 2017).

Pre-tests are quantitative data generation tools that measure participants' current or baseline levels of the intended result. They are given before an intervention or treatment (Cohen et al, 2011). Therefore, to determine deaf ESL learners' current writing abilities, research participants were given a pre-test, which allowed TCA to be used as a treatment. According to Creswell and Creswell (2017), pre-tests play a crucial role in identifying individual variations at a given outcome measure level and accounting for them in data analysis. By accounting for antecedent individual variations, pre-tests offered a more precise assessment of the intervention impact. These pre-test measures on deaf learners' current level of writing supplemented the qualitative measures obtained from DA for authentic results and convergent purposes

Conversely, a test that is given to assess the efficacy of an intervention after it has been completed is called a post-test (Stewart & Oshamdasani, 2014). The primary objective is to assess the effectiveness of the treatment given. Following the administration of a pre-test to assess learners' current writing skills, a post-test was conducted to ascertain if the treatment provided improved their abilities. Simply put, the pre-test creates a baseline against which the results of the post-test will be examined to see whether the intervention had any impact on the outcome measure.

To be more precise, individually administered tests were used to obtain reliable and accurate results regarding the effects of TCA on the writing skills of deaf ESL learners. For this reason,, as stated by the USA Department of Education (2018), assessing and evaluating deaf learners is a complex process, and problems are frequently overlooked by people who are unaware of the hidden effects of hearing loss. Thus, examinations created especially for deaf learners are required. This is due to laws (Every Student Succeeds Act 2015; Individuals with Disabilities Education Act, 2004; No Child Left Behind, 2001) requiring involvement from people with disabilities in standards-based education and assessment initiatives.

3.7.5.1 Hammill & Larsen's Test of Written Language

The current study used the fourth edition of the Hammill and Larsen Test of Written Language (TOWL-4) (Hammill & Larsen, 2021) in compliance with the aforementioned mandate. The National Council of Teachers of English (2018) states that the TOWL-4 is an essential component of literacy teaching and learning growth and practice. These literacy evaluations cover everything from learners' written work to formative comments. In particular, TOWL is a crucial assessment that helps teachers make judgments about how best to teach deaf learners and comprehend their development as lifetime ESL learners.

For example, the TOWL, which was given as a pre-test, served as a benchmark to determine the deaf learners' current level of writing proficiency as well as which learners were unlikely to succeed in improving their writing proficiency with or without additional assistance (Munger, 2016). It would certainly be reasonable to suppose that the additional support entailed more intensive techniques, such as more teaching given to a small group of learners.

The TOWL-4 was also considered a diagnostic tool. According to Munger (2016), these assessments use standardised examinations that are given one-on-one to learners by highly qualified educators such as speech and language pathologists, special educators (the researcher), and reading instructors. In addition, subsections concentrating on particular aspects of writing, like word recognition, decoding, and written language, must be included in the diagnostic evaluation. For example, the TOWL-4 in the current study has particular sections on the lexical and syntactic complexity of writing in ESL, and was individually administered for all deaf learners.

To begin with, Hammil & Larsen's TOWL consists of simply two forms, each of which has seven subsets that represent the conventional, linguistic, and conceptual components of writing (Hammill & Larsen, 2021). Subsets 1 through 5 may use formal forms whereas subsets 6 and 7 may use an impromptu story to target important language skills (spelling, vocabulary, punctuation, sentence combining, logical sentences, story writing, and contextual norms). The significant abilities mentioned above were evaluated for the deaf learners in the current study using an impromptu story.

Specifically, Hammil & Larsen's TOWL is a standardised assessment instrument for assessing writing abilities. Its main goal is to give teachers insightful information about learners' writing abilities, especially those from underprivileged backgrounds like deaf English language learners. Additionally, it is employed and can be utilised for 60 to 90 minutes at a time to individually monitor learners between the ages of 9 and 17.

Nonetheless, it was given to deaf learners between the ages of 10 and 21 because deaf learners sometimes put off attending school because of several particular difficulties that affect their academic trajectory (Guardino & Cannon, 2015). The format and guiding principles of the tests—rather than their adoption—are the sole factors considered when evaluating the efficacy of TCA. This complies with the IDEA (2004) provision that, unless it is not practicable, tests and other processes for the deaf must be conducted in the learners' preferred medium of communication.

To shed more light, the pre-test used in this study enabled me to identify the particular difficulties and advantages faced by deaf learners as they worked to improve their writing abilities in English as a second language. Consequently, comprehensive data derived from DA conducted before an intervention was implemented and supplied to verify the deaf learners' present writing proficiency. Nonetheless, when given as a post-test, it was useful in comparing results to normative data (McCrimmon & Climie, 2011), which allowed for a more thorough comprehension of deaf people's performance (Bintoro et al., 2923) in relation to their pre-test results. It also assisted in determining how effective TCA was as an intervention strategy.

Furthermore, to ensure validity and reliability, Hammil & Larsen's TOWL is administered in a controlled setting by a qualified individual or professional who adheres to established protocols (McCrimmon & Climie, 2011). To ensure that the classroom environment was deaf culture friendly, it was conducted in the presence of a deaf English language teacher, who was knowledge-rich about deaf culture, and the English language. Additionally, its scoring criteria was predetermined based on established deaf learners' norms, allowing for consistent evaluation across different learners.

For the test's content validity, however, since the intervention includes all communication modalities to teach reading, the researchers chose stimulus images that were recognisable and child-friendly for deaf people (McCrimmon et al., 2011). The researcher subsequently inquired with the teacher of deaf learners for feedback on the test (Hammill & Larsen, 2011).

3.8 Data Collection

This section of Chapter 3 explains how data collection was done using the Embedded Mixed-Method research principles, which focuses on gathering data in two stages. Gay et al. (2011) argue that before every other aspect, researchers should outline the precise methods and resources used in the field, such as the data collection strategy and the instruments used to gather data (Koloti, 2016).

To gather data, the following procedures were followed: I first identified the gap in the teaching and learning of English for deaf learners on my various visits to one primary school in Leribe. After submitting the research topic to my supervisor at the National University of Lesotho, the study literature was reviewed. Understanding the research problem—and the pertinent literature on the difficulties deaf learners have in developing writing skills—was the main motivation. In light of this, research topics and theories were created. Subsequently, ethical considerations were taken into account and the research methodology and study framework that directed the data generation process were determined. Thereafter, a pilot study was conducted at the nearby school to test the data generation tools.

3.8.1 Pilot study

A pilot study is a preliminary inquiry to collect preliminary data, test procedures, and determine whether the intended research is feasible, (Nolan et al.,2013). It tends to be the initial stage in the research process and helps determine how participants are affected by a study (Oliver, 2003, p. 37). As a result, a pilot study was conducted at a nearby primary school with deaf learners in Leribe; the identity of this school will remain anonymous from the main investigation.

Additionally, conducting pilot research can help with reviewing frameworks and procedures, highlighting issues before the start of a study. This is due to the complex nature of producing reliable, rigorous research that improves theory development and influences practice (Secomb & Smith, 2011). For example, because mixed-method researches take a long time, pilot studies can shorten the time it takes to put findings into practice and lessen the possibility of study duplication (Becker, 2008).

Specifically, in the quantitative phase of the present study, it assisted in testing tests and performing sample size calculations. This enhanced the rigour of the main study. While in the qualitative part of the study, it helped increase the trustworthiness of the findings and transparency of the audit trial (Bryne, 2001). This was enhanced with experiential logistics from actual procedural implementation, facilitating a more systematic approach to data collection and subsequent analysis.

One important aspect of gathering data has been suggested to be the requirement for carrying out a pilot study to develop and improve categories that are both comprehensive and distinct (Cohen et al., 2018). This suggests that DA, observations, and FGDs were conducted in addition to the tests to examine whether the tests tested what was intended to be tested. This was advantageous because it gave early indications about areas where the primary study may falter, potential breaches of research procedures, or whether recommended methodologies are inappropriate or unduly complicated. (Secomb, 2011).

Pilot studies are crucial in mixed methods research because conflicting methodological stances can produce ineffective results (Cohen et al., 2011). If the approach's viability is examined and preliminary findings evaluated, this allows the researcher to consider and defend their theoretical and methodological choices, which will result in a research report with coherence and a clear line of reasoning (Lipscomb, 2007).

As participants may offer information on the appropriateness of the planned instruments, it was specifically used in this study to evaluate the content validity of the instrument and validate the suitability of the major outcome measure. Additionally, it is claimed that pilot studies help researchers become more adept observers (Creswell & Creswell, 2018). Scholars, however, criticise them for having problems with extrapolation and having insufficient power to reach statistical significance, which may lead to conclusions that are not generalisable.

More specifically, the pilot studies are claimed to improve the content validity and reliability of instruments that were previously established in terms of their applicability to present-day deaf ESL learners (Lavis, 2004). The research tools' relevance and ease of understanding were thus confirmed by the deaf ESL learners and English language teachers who participated. It follows that the content validity of the interviews was preserved for the ensuing study, confirming TCA's acceptability as an intervention for the intended population (deaf ESL learners).

3.8.2 Data Collection Procedure

A researcher must adhere to certain phases in the data generation technique, as stated by Creswell & Creswell (2018). As a result, the current employed the Embedded design within PAR phases to collect data and it is described in detail below:

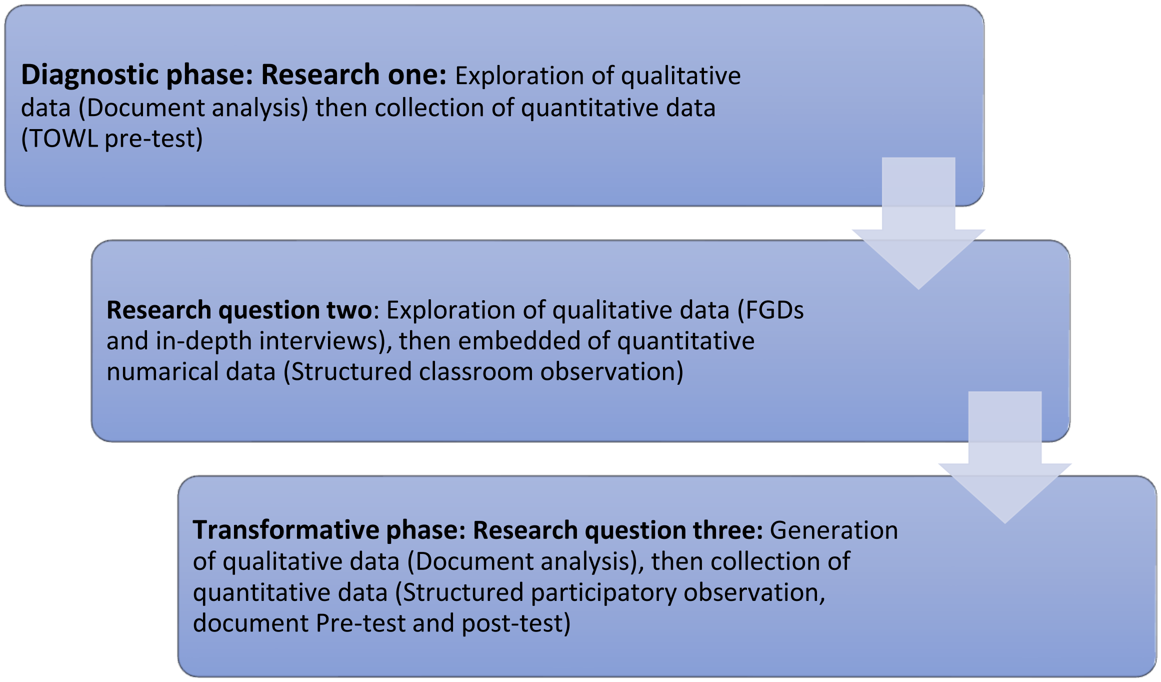

Figure 4. Data collection procedure

As earlier explained, I incorporated a sequential embedded design in mixed method, I sequentially collected qualitative data first in the three research questions, then explained those findings using quantitative numerical data Creswell, 2014). It appears that a variety of strategies were used in each step in the PAR phases as evident above. However, before that, the faculty sent an introduction letter to the school (research site) for ethical reasons after receiving permission from the school administration to get in touch with a researcher. It was released to protect research participants' autonomy, rights, dignity, and well-being (Schembri & Jahic Jasic, 2022). After that, I met the deaf ESL learners and the ESL teachers to attempt to get their informed consent and make sure everyone was aware of the goals, dangers, and benefits associated with the study.

Furthermore, Cohen et al. (2018) clarify that general ethical concerns such as unequal power relations should also receive adequate consideration while generating data. For example, during the first phase of data generation, I addressed ESL teachers about the ethical considerations that arose in the complicated language environment that hosts multilingual research projects such as the one under consideration. Schembri & Jahic Jasic (2022) explicate that the process of gathering data through interviews may provide ethical quandaries about language-based power dynamics, data manipulation, and visualisation. Therefore, for two days, I had to build confidence with ESL teachers, which was necessary for cooperation, openness, and sharing of research findings.

To be more precise, as was already said, during the diagnostic stage, I assessed the written books of deaf ESL students to determine the difficulties they encountered when writing. After gathering this qualitative data, I gave the TOWL pre-test to integrate with the qualitative results and provide a clear picture of the difficulties deaf ESL learners encounter when writing in the language. All of them were carried out to determine the underlying cause and respond to the phase's first research question. To address the second research question, I conducted FGDs with deaf ESL learners to better understand their language and communication backgrounds. This helped me identify the communication modes that TCA should use to help the learners write more fluently in ESL. The suggested modalities from the FGDs were then validated by conducting in-depth interviews with deaf ESL teachers to generate qualitative data. Using structured classroom observation, I observed the same teachers who were interviewed, validating the qualitative findings because this is an embedded mixed-method study.

Specifically, classroom observations offered direct insights into real-world contexts (Jain, 2023) of teaching strategies used to teach writing to deaf ESL learners, and the in-depth interviews allowed for individualised exploration (Espedal et al., 2022) of individual ESL teachers' viewpoints on strategies. Meanwhile, FDGs facilitated group interactions and diverse perspectives of language and communication background of deaf ESL learners.

In this phase, several data analysis methods were used. Initially, I coded the data on themes in the Reading to Learn Assessing Writing Tool to determine the present writing proficiency of deaf ESL learners after organising and gathering data from portfolio assessments. Second, audio transcriptions from in-depth interviews with teachers (Bailey, 2008) and the FGDs of deaf ESL learners were also incorporated in this phase to analyse the different communication modalities that may be used with TCA. This also required writing codes in the Atlas.ti software.

Using software and manual methods to analyse data appears to have a variety of implications, which improves the reliability and rigour of research. While the software tool helped in efficiently handling large volumes of data, such as those from observations, and in-depth interviews, while simultaneously cleansing, saving time, and reducing manual errors, the manual analysis tool helped me apply my expertise and critical thinking directly to qualitative data analysis (Datatab, 2022)

Second phase of PAR was generation of data in transformative phase. The intervention began after administering the TOWL pre-test, which was used to gather data to validate findings from the R2L Writing Assessment tool. For eight weeks, five lessons a week, the deaf ESL learners were exposed to TCA to improve their writing abilities in ESL. Because the study is participatory action research, below is detailed information on how the intervention was carried out. A TOWL post-test was given following the intervention, and its efficacy was determined through the analysis of the results.

Given that PAR is a spiral action that involves several key steps: planning, acting, observing, and reflecting. Adapted from Kemmis & McTaggart (2005), it was carried in 2 circles and is described in detail below:

Circle 1: Lasted for the first 4 weeks. In planning stage: This is figuring out what needs to be addressed, getting ready for it, and establishing objectives that support the main goal (George, 2023) of enhancing the writing abilities of deaf ESL learners. As a result, the researcher prepared a lesson covering a variety of writing skills, gathered teaching and learning resources, and made sure the setting was linguistically diverse. For example, the researcher downloaded videos, printed pictures, cut and assembled words to create word and letter cards (see appendix two), and created lesson plans.

In action stage: According to Kemmis & McTaggart (2005), this phase involves carrying out the prearranged activities. Thus, the researcher gave the deaf ESL learners an introduction to the classes, utilising various infographics to guide their instruction and assigning homework and peer tutoring activities (see appendix two). Peer tutoring activities focused largely on sentence construction (see appendix three), asking deaf ESL learners to complete gaps in sentences, create stories by grouping photos together, and practice spelling bees.

In observing stage: approach entails monitoring and gathering the intervention's findings, particularly the process of teaching and learning (Baldwin, 2012). Here, the researcher watches the process of instruction and learning. The manner in which TCA was implemented. Even the deaf ESL learners' ability to use infographics was observed. Girls were more engaged in activities that required them to show vocabulary skills than boys. Boys engaged mostly in fingerspelling activities. The researcher found that teaching deaf ESL learners through chaining in combination with peer tutoring improved their social connection and improved their understanding of ESL grammar.

In reflection stage: At this point, observations are analysed, experiences are considered (Bedford, 2022), and the usefulness of various interventions in improving writing skills is assessed. In this instance, the researcher documented which infographics were effective and how the setting lessened the cognitive load on deaf ESL learners as they developed their writing abilities. It is worth noting that the reflection in this case is documented in the lesson plan, under evaluation section. Additionally, it was highlighted that the following circle contained revisions to the deficiencies. It was specifically mentioned that deaf ESL learners were not improving their spelling skills through videos. Spelling became a skill that required visuals and song practice. However, chaining helped them improve their ESL sentence structure and vocabulary (see appendix four as an example of how it was evaluated how chaining helped).

Circle 2: This was from week 5 to week 8. This circle, which begins at stage one and continues through stage3, is now called revised planning (Carr &Kemmis, 1986), and it includes items that I did not include in circle 1's planning. Here, I had to implement and develop further on existing teaching strategies such as chaining, create an even more engaging learning environment by assigning grade 4 books based on the learners' cognitive load (see appendix five), displayed word and letter cards, provided games and music to engage learners, and reserve a smartboard room.

In action stage: New techniques and motivation were included into the teaching process by the researcher. I used games, songs (see lesson plan on appendix six), and infographics in a language-rich environment to help learners improve a variety of writing abilities. Additionally, I provided peer tutoring and focused on filling in the blanks for spelling, grammar, punctuation, and vocabulary growth in writing by filling in words and letters. To encourage more zeal in spelling drills, I colored the letter cards in various shades.

Observation stage: the researcher observed how learners interacted with the new teaching aids, and how the language-rich environment allowed for knowledge integration through peer tutoring on a smartboard (see Appendix Seven), presentations, and roleplaying. Fingerspelling and pictures reinforced writing activities (see Appendix 8,9 and 10). Using letter cards with sensory activities helped increase motivation among learners due to dynamic nature of activities. Better comprehension of spelling as deaf ESL learners receive information through multiple channels (see appendix 11).

Reflection stage: I reflected on the entire procedure. The manner in which the intervention was implemented, how learners and the researcher interacted, and how they reduced cognitive load and legitimised information (Car & Kemmis, 1986; de Vos et al, 2021). Thus, the learning environment was improved by the inclusion of games, music, and sign language interpretation. These improved the communication among learners and between myself and the deaf ESL learners. A wide range of communication mediums, such as music, images, and smartboards, helped deaf ESL learners retain information while concurrently processing spelling, grammar, vocabulary, sentence structure, punctuation, and paragraph writing.

For a thorough understanding of how the stages of stages were carried out, a detailed table below shows what stages were taken in each research question.

Research questions	Action research stages	Data generation instruments
1. What challenges do deaf learners face in writing in English as a second language?	Observe, plan,	Document Analysis, Harmill, & Larsen's TOWL Pre-test
2. What communication modalities can be incorporated in TCA to improve	Observe, plan	In-depth interviews, Unstructured Observations, Focus Group Discussions

	deaf learners writing in ESL?		
3.	How does the implementation of TCA strategies improve deaf learners' writing in ESL?	Plan, Observe, act, reflect	Harmil & Larsen's TOWL Post-test, Structured observation

Table 2. Research questions, action research phases, and instruments adapted from Makumane (2018)

3.9 Method of Data Analysis

Using appropriate data analysis techniques in research is critical. In mixed-method research, there is a need for researchers to utilise both quantitative and qualitative data analysis methods, to analyse the generated data through different methods. Patton (2015) further explain that data analysis is the procedure for examining, purifying, altering, and modeling data to extract knowledge that helps make decisions. Thus, to analyse the quantitative and qualitative data generated in the current study, several data analysis techniques were used. Atlas.ti software and the Reading to Learn (R2L) Reading and Assessment tools were incorporated to analyse qualitative data.

3.9.1 Reading to Learn Assessing Writing Tool

According to Rose (2005), the R2L assessment tool states that the first step is to analyse the word, followed by the phrase, text, and context within the word. This suggests that while forming words, one should search for patterns in the spelling and syllables, for word groupings, patterns in sentence grammar, and for text and context, paragraphing (patterns within text discourse).

Additionally, the assessment tool highlights the significance of understanding the text's content and organisation, such as the events in stories or the information contained in factual texts, and the word level, which involves understanding each word's meaning and the way letters are arranged to spell words (ibid). As a result, I assessed the words that deaf ESL learners responded correctly or incorrectly to, noting trends such as word structure, word length, and specific graphemes in writing. It is through this that I got a clear picture of deaf ESL learners' writing needs. As Munger (2016 asserts, the writing assessment instrument reveals the language resources and abilities that learners possess, allowing for the planning of the teaching program.

Conversely, it was also critical to analyse the language used in the written materials of deaf learners. For example, I looked specifically at the sentence structures, the degree of jargon in the vocabulary, the degree of abstraction required to understand the text, and the complexity of language structures (since it has been previously noted that the language of deaf ESL learners differs from English in form and structure) (Department of Education, Victoria, 2022). It seems that the R2L evaluation tools offer more precise instructions on how to evaluate each feature and what to look for. I also used it to analyse the deaf ESL learners' FGDs to analyse their language and communication background in their lexical and syntactic choices to determine which communication modalities to incorporate in TCA.

3.9.2 Content Analysis

Content analysis as a qualitative data analysis method is used when one wants to analyse written or spoken records (or other meaningful matter) for the occurrence of specific categories or events, items, or behaviour (Cohen et al., 2018). On the one hand, Holsti (1969) points out that proper content analysis entails three characteristics: it should be objective and guided by an explicit clear set of rules to eliminate any subjective influence, it should be systematic and lastly have generality, meaning that the findings should fit within a theoretical, empirical or applied context.

In the current study, it was used to analyse in-depth interviews' responses for the presence of certain concepts and themes for me to identify the communication modalities to employ in TCA. As earlier explained it is systematic, it was employed in conjunction with ATLAS.ti software to generate the relationship between the codes. This is because Holsti (1969) explains that the disconnected facts generated from content analysis are of little value.

However, it is criticised for its descriptive nature, hence I established the causal relationship between the codes using the software. That is, given that it is an objective form of analysis, I therefore looked for patterns in deaf ESL teachers' responses, paying attention to which patterns vary or do not vary or how and organisation of those patterns into one (Knoblauch et al., 2008). Executing this helped catch both the detail and bigger picture of communication modalities to use in TCA and helped avoid being over-reductionist. In summary, it is advantageous in helping researchers quantify and analyse content within various forms of communication (Snell, 2011).

3.9.3 Thematic Analysis

For less structured and unstructured data from fieldnotes and videos, thematic analysis summarises and codes qualitative data. According to Maguire & Delahunt (2017), thematic analysis is the process of identifying patterns or themes within qualitative data and provides “core skills that will be useful for conducting many other kings of analysis” (Braun & Clarke, 2006, p. 78). Thus, in the current study, it was used to summarise deaf ESL learners’ books (DA). It provided a basis for using Rose’s (2005) Reading to Learn Assessing writing tool to explore the challenges that deaf ESL learners face in writing in ESL.

In addition, theme analysis concentrates on finding, evaluating, and deciphering meaningful patterns in qualitative data (Clarke & Braun, 2013). Accordingly, it would seem that this will enable a more flexible examination of the difficulties that deaf ESL students encounter when writing. Its adaptability enables it to concentrate on the explicit meaning (semantic meaning) or explore the underlying presumptions and concepts (latent meaning), enabling more in-depth analyses of the data. To better understand the explicit meaning included in learners' written work and to highlight the difficulties they have while writing in ESL, the assessment writing tool was designed to assist a thorough exploration of that meaning.

Thematic analysis may employ a deductive method, in which pre-existing theories guide topic identification, or an inductive approach, in which themes emerge immediately from data. In this instance, deductive coding methods were employed to categorise the written work of deaf ESL learners into themes and subthemes, guided by the assessment writing tool.

3.9.4 Atlas.ti Software (version 24.)

On the other hand, teachers' in-depth interviews were analysed using the ATLAS,ti software. Because of its ability to discover, code, and explain unstructured data, this qualitative data analysis software comes highly recommended (NYU Libraries, 2020). It enables researchers to code data, become familiar with the codes, and then automatically generate a write-up on the themes, enabling them to analyse volumes of data that are text-based, audiovisual, or graphical. For example, the researcher was able to develop themes from the responses provided by the teacher interviews, establishing an overview of the strategies that may be employed with TCA. After a pre-test had been completed, the same teaching strategies were used with deaf ESL learners.

3.9.5 Inductive Coding

According to Rossman & Rallis (2012), coding is the process of organising data by enclosing sections in brackets and labeling words that represent categories in the margins. The study based on the pragmatic philosophical lens emphasises the value of pragmatism and a variety of viewpoints in comprehending complicated occurrences. As a result, the ATLAS.ti software and coding were employed in the current study to fully identify the communication modalities to be used in TCA. Khalema (2023) states that the procedures can adopt either an inductive or deductive approach. Consequently, the current study employed inductive coding, which entails creating information from ground-up by examining insights from the qualitative data itself (Atlas. ti Newsletter, 2024). As a result, it assisted me in analysing the qualitative data primarily for its significance rather than how it could appear beneath external frameworks of knowledge. This implies that the themes and concepts emerged originally from raw data (deaf ESL teachers' responses in in-depth interviews).

3.9.6 Deductive Coding

According to Bingham (2023), deductive coding is a top-down methodology in which the researcher begins with a predetermined set of themes or codes that are drawn from accepted ideas or research topics. It is methodical and well-organised. The researcher starts with prior information and a conceptual understanding of the study problem while using this coding method. To put this into practice, I created a template of codes called "a priori" and then looked for passages that would work with the code. Later, to determine the sub-themes, I verified and legitimised the coded themes by applying the preconception, summarising and identifying initial themes, applying the code to the raw data, and connecting codes and identifying themes (see Figure 4.2). All these are suggested by Bihu (2024).

Through the use of Rose's (2005) Assessing Writing tool, I was able to apply deductive coding to analyse portions of generated data by executing coding processes with pre-existing thought codes. That is to say, this coding procedure made sure that themes and sub-themes that explored the difficulties deaf ESL learners encounter when writing in ESL were identified.

3.9.7 Verbatim Quotations

Verbatim quotations or transcriptions were incorporated into the analysis. These are direct quotations from deaf ESL learners and their ESL teachers and were employed in the analysis to enhance research findings, as recommended by Phaswana (2010).

3.9.8 Descriptive Statistics

Descriptive statistics were thus used to analyse pre-and post-test scores for quantitative data. Several variables are used in descriptive statistics to aid in understanding a dataset's central position (Ayanwale, 2020). It offers concise descriptions of the sample and metrics that shed light on its overall distribution and variations in the central tendency. Therefore, the post-test results of deaf ESL learners were analysed using central measures of central tendency and measures of dispersion to determine the impact of TCA on their writing abilities.

More specifically, measurements of central tendency: mean determines a data set's average value (Tabachrick & Fidell, 2013). This value enabled me to assess if the exam scores of deaf ESL learners had improved. On the other hand, when placed in ascending order, the median accounted for the midway value. This value proved useful in identifying any changes in the proficiency level of deaf ESL learners as well as in situations when test results contained outliers that could distort the mean value.

Conversely, dispersion measurements, such as standard deviation, quantify how far a set of data points deviate from the mean (Datatab, 2022). I could determine the degree to which the scores of a particular deaf ESL learner differ from the average by computing the prior and post-TCA as an intervention. This made it possible for deaf ESL learners to consistently develop their writing abilities.

3.10 Ethical Issues

Ethics is often characterised as "a matter of principled sensitivity to others" (Cavan, 1977, p. 86) and deals with what is good and bad, right or wrong. Specifically, Hasan (2023) suggests that because mixed method studies employ a range of data collection techniques, each involving distinct research participants, ethical considerations may be more complex than in single methods. Therefore, introductory letter, informed consent, non-traceability, non-maleficence, participant burden, communication, dissemination, data management, and privacy must all be considered by researchers when conducting their work.

3.10.1 Introductory letter and informed consent

All of the aforementioned elements, and the following elements—such as the backdrop of the study, the procedures to be followed, the methods for collecting data, the intended use of the data, and the reporting of the findings—are derived from the nature of research itself (Cohen et al., 2018). All this ought to be effectively communicated before the start of research. Thus, the school where I did my research received an introductory letter from the faculty before the commencement of data generation. Deaf learners were then assured informed consent after being informed about the research protocols. This pertains to autonomy and arises from the freedom and right to self-determination of every individual involved (Crandall, 1978).

3.10.2 Non-traceability

The steps involved in conducting the research were adequately described to the deaf learners. It is countered that disclosing the entire scope of the research's goals and purposes might skew the results, since participants may behave differently as a result of being aware that they are being monitored (Oliver, 2003, p. 53). However, the participants were guaranteed that their identities would not be revealed in any manner in the research. Furthermore, the researcher mitigated the "participant burden" (Adu et al., 2022; Hasan, 2023; Spicker, 2022) on deaf learners by strategically allocating their time and effort across all activities, acknowledging that they are unique learners.

3.10.3 Data management

According to Hasan (2023), data management entails safeguarding participant identities, managing and storing data securely, and guaranteeing its accuracy. As a result, the researcher informed participants of the results at every stage of the investigation, taking into account the implications for both the individuals and the larger community.

3.10.4 Non-Maleficence

Furthermore, the information presented above supports the idea of non-maleficence, which takes into consideration the need to protect individuals from harm (Cohen et al., 2018). This was made possible, in part, by being open and honest with everyone about the research procedure, conclusions, and modifications made along the way. I implemented strategies to mitigate risks.

Since my study involved assessments which might be stressful for deaf ESL learners, I provided them breaks to reduce their anxieties. However, Stadnick (2021) pointed out that regulating participant burden, communication, and dissemination—tasks that call for particular strategies—may be challenging for researchers. Hammersely & Trainou (2012) effectively assert that if promises of anonymity and confidentiality cannot be fulfilled, then such promises should not be issued.

3.11 Validity and Reliability

3.11.1 Validity

The foundational ideas of naturalistic research stem from the notion that validity is determined by the reliability, usefulness, and trustworthiness of the researcher's work (Creswell & Creswell, 2014). It is concerned with the veracity and credibility of research as well as whether it is examining the subjects for which it is intended. According to Burns (1999, p. 160), validity is a crucial factor in determining the calibre and acceptance of research.

3.11.1.1 Content validity

The evaluation of instruments by subject-matter experts aids in the clarification of ambiguous and imprecise questions and helps guarantee content validity (Cohen et al., 2018). Experts might reject ineffective or non-functional inquiries even though they seem legitimate on the surface. Long-term observation allows the researcher to collect live data for analysis, which naturally improves validity (Onwuegbuzie & Collins, 2007).

It is crucial to note that mixed-method research's validity can be enhanced by demonstrating rigor and dependability in data generation and analysis (Giddings & Grant, 2009). Whereas rigour refers to the correctness and precision of quantitative data, trustworthiness is the quality and believability of qualitative data. Techniques like validity checks and statistical procedures may be used to provide rigor, and triangulation, member checking, and peer review are some ways to build trustworthiness (Educ Central, 2021). Precisely, all these ensure the quality and credibility of qualitative data and maintain the accuracy and precision of quantitative data.

3.11.1.2 Interpretive validity

As per Zohrabi (2013), to guarantee the validity of the study, the participants will be contacted again to confirm the results and interpretations of the data. Interpretive validity is the truthfulness of interpretations of the generated data (Cohen et al., 2018). To verify the information provided by the interviewees during the procedure, for example, the results and interpretations were provided to them. According to this explanation, the generated data's authenticity and plausibility were acknowledged and endorsed. Conversely, the researcher ensured that several study participants who were not involved in the research evaluated and provided feedback on the research data (Petersen & Gencel, 2013). To be more precise, the English language teachers from other classes were thought to possess extensive subject-matter knowledge. People who are knowledgeable about the topic being studied should conduct peer examination, according to Zohrabi (2013). Remarks on the interviews and observations made in the classroom were requested from the teachers.

3.11.1.3 Participatory validity

According to Espadal et al. (2022), including the majority of participants at every stage of the study improves validity and allows people with disparate points of view to agree on the study's conclusions (Lynch, 1996, p. 62). As a result, "researcher's biases" were reduced when the majority of participants were included in every stage of the study. Each researcher indeed holds unique values, opinions, and worldviews (Peterson & Gencel, 2013; Zhorabi, 2013). This is because to be as objective and transparent as possible, the researcher was at various stages of the study explicit, critical, and consistent.

To put it succinctly, Onwuegbuzie & Johnson (2006) and Zhorabi (2013) clarify that utilisation and dissemination of study results also guarantee validity in mixed approaches. In other words, ensuring that study findings are successfully communicated to pertinent audiences guarantees that the findings are used appropriately. As a result, the research findings were presented to the program personnel in a way that was both clear and practical. In support of this, Onwuegbuzie & Johnson (2006) assert that “research needs to be defensible to the research and practice communities for whom research is produced and used” (p. 48).

3.11.1.4 Cultural validity

Cultural validity requires awareness of the participants, their cultures, and the research settings (Cohen et al., 2018). I provided written templates in their exact sign language grammar to make them feel included and provided direct translation to English as a second language grammar to raise awareness of this. This was due to Morgan's (2005, p. 1) assertion that it entails recognising and comprehending key terms used in the target culture; considering relevant literature written in the target language; selecting research instruments that are acceptable to the target participants; verifying interpretations and translations of data with native speakers; and being aware of one's cultural filters as a researcher.

3.11.1.5 Concurrent validity

Concurrent validity requires that data produced with one tool have a strong correlation with data produced with another instrument, according to Cohen et al. (2018). Given that this study is Embedded Mixed-method, it was crucial to improve the validity of the data and findings since they are integrated. I employed a qualitative DA and a quantitative TOWL pretest to elucidate the qualitative results to determine the difficulties deaf ESL learners had when writing. As discussed in section 3.12.2.4, triangulation (ibid) is a crucial concurrent validity to increase the reliability of results.

3.11.2 Reliability

Consistency, dependability, and reproducibility of "results obtained from research" are the three main aspects of reliability (Numan, 1999, p. 14). Accordingly, Lincoln & Merriam (1998) propose that the researcher's position, triangulation, and audit trial might be used to assure dependability. For example, a researcher may provide a clear explanation of the steps involved in the research process and go into great depth about the design, subjects, and purpose of the study. This purpose of the research may be explained to all parties involved, including deaf learners.

To emphasise further, as data in quantitative research is numerical, it is simple to produce comparable results. Nonetheless, due to the subjective and narrative nature of the data, qualitative methods produce similar but more challenging outcomes. According to Lincoln & Guba (1985, p. 288), it is preferable to consider the consistency and reliability of data rather than aiming for identical outcomes. In this instance, the goal is to agree—rather than to arrive at identical conclusions—that the data-gathering procedure produced consistent findings and results, as demonstrated by techniques including audit trials, peer reviews, and triangulation.

3.11.2.1 External reliability

Firstly, the researcher first needs to explain explicitly the different processes and phases of inquiry, elaborating on every aspect of the research, the rationale, design, and subject. This is one way the researcher ensured external reliability by explaining to the participants how the data was going to be collected, analysed (Middleton, 2023), and how the codes were going to be derived in data analysis (Onwuegbuzie & Johnson, 1996). External reliability as explained by Zohbari (2013) is concerned with the replication of the study. Hence, clearly explaining the role of the researcher, the informants, and the social situations ensured that the academic social situation and condition were fairly constant and uniform. Enhancing external validity even further involved clearly outlining the many steps involved in data gathering and analysis. It is stated that defining and characterising constructs makes replication easier, which improves dependability.

3.11.2.2 Inter-rater reliability

According to Cohen et al. (2018), this involves ensuring agreement among observers on instruments. Therefore, in the current study, it was ensured through pilot testing and regular calibration to discuss the discrepancies to reach a consensus. Additionally, I also used standardised tests to minimise errors and clearly operationalise definitions. In this case, I defined what constitutes TCA and how it is going to be implemented. In addition to the previously mentioned methods, defining the key concepts, definitions, units of analysis, and premises—as well as providing detailed explanations of the underlying assumptions—also served to guarantee reliability (Zohrabi, 2013).

3.11.2.3 Internal reliability

Research studies can improve the reliability of peer review in reliability, as opposed to validity, when peer review is predicated on data examined by nonparticipants. The consistency of data collection, analysis, and interpretation is known as internal reliability (Zhorabi, 2013). Following that, by mechanically recording data, all of these might also be improved. Interviews are recordable and archivable, according to Cohen et al., (2018); Zhorabi, (2013). Reanalysis and data replication are much easier to implement when such conversations are recorded.

3.11.2.4 Triangulation

The utilisation of multiple data generation instruments in data collection not only improves the replication of study findings but also evacuates risks to external reliability by providing detailed explanations of data collection procedures, analysis, theme development, and how results are obtained. According to Creswell (2005), the stability and consistency of the study findings are referred to as dependability. To be precise, for the three research questions, I triangulated data generation tools to ensure that they measured what they were intended to measure. For research question one, I used qualitative DA and TOWL pre-test, for the second research question, I employed FGDs, in-depth interviews and structured observations, and lastly for the third research question, qualitative DA was triangulated with quantitative measures of TOWL post-test and structured observations.

Triangulation, or the employment of varying data generation tools—as in the current study, where in-depth interviews and FGDs were utilised to answer the same research question—is how this was assured. This triangulation of data through different procedures assisted in "heighten dependability and trustworthiness of the data and its interpretation (Zohrabi, 2013, p. 254). This is due to Cohen et al.'s (2011) explanation that using a single approach to collect data might be dubious, biased, and insufficient.

3.12 Methodological challenges

Given the nature of the current research, methodological approaches might present some obstacles. First, sampling— specifically, sample size—was the obstacle I encountered. Finding an appropriate sample size that accurately reflects the entire population of deaf ESL learners was difficult for me. I had not anticipated to find that more than 25% of my sample size consisted of deaf ESL learners who were also mentally retarded and intellectually impaired.

The second obstacle had to do with generating data, notably with the several meetings I had to have with a deaf ESL teacher to confirm that my research instruments and teaching aids were appropriate from a cultural and linguistic standpoint for the deaf ESL participants. According to Fernandez-Gomez (2020), research tools, especially in studies on education including individuals with impairments, should be validated by an expert in the field.

Research bias presented another difficulty; I had to constantly remind peer coaches to be honest with me and to be conscious of my prejudices and presumptions regarding deafness and literacy. To prevent misinterpreting or distorting the experiences of deaf ESL learners, Atkins et al. (2023) and Smeltz et al. (2024) emphasise that researchers must approach such studies with humility and care. Obtaining informed consent from the parents of the younger deaf learners was a barrier in addition to this one. The majority of them stay at boarding schools, thus I had to notify their boarding masters instead of contacting their parents.

3.13 Summary

The pragmatism paradigm served as the foundation for the study to give a comprehensive grasp of the issue being studied. The objective and subjective realities of deaf ESL learners' writing abilities were examined using mixed-method research. The tests, interviews, focus group discussions, and observations produced sufficient data for the current study. Data and analysis are presented in the upcoming chapter. Data and analysis are presented in the upcoming chapter.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.0 Introduction

This section of the paper provides data presentation and analysis. The data is presented based on the two phases of the phases of action research; the diagnostic and transformative phases per embedded design of mixed-method research. As I needed to decide when, in what sequence to collect data, sequentially or concurrently (Cohen et al., 2018), therefore I collected data sequentially- qualitative data first, followed by quantitative data. The same sequence applies to data presentation.

In the diagnostic phase, data was generated from the first and second research questions to comprehensively understand the learners' writing skills and communication modalities to employ in TCA to develop deaf ESL learners' skills. Document analysis and a pretest were used for the first research question. The second research question was addressed using focus group discussions, structured observations, and in-depth interviews. The transformative phase consisted of data from the third research question using structured observations document analysis, structured observation, and a post-test. For research transparency and reproducibility, the participants' biographic information is presented to provide participants' contextual understanding, for data interpretation, data quality, and identification of patterns and trends in the data.

4.1 Biographic information of research participants

The current mixed method study participants consisted of grade 7 ESL learners and two deaf ESL teachers from one primary school in Leribe. Deaf ESL learners were 30 in total (12 girls and 18 boys). Apart from this, there were two deaf ESL teachers, a 30-year-old male and one 62-year-old female.

4.1.1Language

The research participants in the study are all deaf, using sign language as a native language and language for daily communication. However, the only difference is that some are of the oralist era (have been introduced to spoken language before) while some from the manualist era only know sign language. English is the second language for all deaf ESL learners and deaf ESL teachers.

4.1.2 Gender

There are 19 males in total; 18 deaf ESL boy learners and one deaf ESL teacher and 13 females; 12 deaf ESL girls and one deaf ESL teacher. Given this, it is evident that there were more male participants than females in the study.

4.1.3 Experience

A male teacher has five years of teaching experience at an inclusive school, while a female teacher has 23 years of teaching experience and 15 years working as a private teacher at an inclusive school. The two deaf ESL teachers are suitable participants for the study not only because they are well versed in deaf culture, but also because they possess a certain experience in studies on ESL and are thus reliable to offer a piece of robust insightful information.

4.2 Diagnostic Phase

In this phase, there were two research questions that were used to diagnose, research question one and research question two.

4.2.1 What are deaf ESL learners' challenges in writing in ESL?

Two data generation tools were used to get a valid current level of writing skills among deaf ESL learners to answer this research question. First, the Reading to Learn Assessing Writing Tool developed by Rose (2005) was used to conduct a document analysis on learners' books. Secondly, a pre-test was also employed. The document analysis of ESL books written by grade 7 deaf ESL learners commences this section of the question is shown below.

4.2.1. 1 Qualitative data Findings

4.2.1.1.1 Document analysis

Rose's (2005) Assessing Writing tool was used to determine the deaf ESL learners' present writing skills. The table below shows a comprehensive comprehension of the process by which the themes and subthemes from the books of deaf ESL learners will be extracted.

Lexical Development	**Syntactic Development**		
Word	*Phrase*	*Text*	*Context*
Spelling- patterns in spelling, syllables, and word groupings.	Patterns in sentence grammar- how well is the sequence of	Text content and organisation- these are arrangements of words in	Understanding each word's meaning and the

Punctuation- correct use of punctuations, especially those needed to make sentences clear, by breaking up sentences such as commas.	words to make a coherent sentence?	sentences for clarity and coherence.	way letters are arranged to spell words.
	Are the grammatical conventions of written English used accurately?	Use of text features such as bold text, spelling, and punctuation for clear communication and handwriting for legibility, ensuring that all words are spelled correctly.	
	A variety of sentence and word group structures		
Presentation of text-appropriate margins, headings, paragraph spacing, placement, or illustrations and neatness			

Table 3. Reading to Learn Assessing Writing tool analysis guide

As evident above, the deaf grade 7 ESL learner's works (portfolio assessment) were evaluated for lexical and syntactic development in their writing. Specifically, their word production (spelling, punctuation, and overall text presentation) was examined, as were their sentence grammar patterns (English grammar conventions, sentence variety, and word groupings), organisation, and word meanings. Below is a presentation of the learners' works which will be followed by the analysis.

Presentation and analysis of deaf ESL learners' written work

Figure 5. Deaf ESL Learners' Portfolio Assessment

Figure 5 above shows deaf ESL learners' written English language work. I examined these pieces of work on the following themes and sub-themes for a thorough understanding of their current level of writing in ESL. It was analysed based on graphic features (sub-themes; spelling, punctuation, and text presentation), grammar (sub-themes; sentence patterns, grammatical conventions, sentence, and word groupings), discourse (sub-themes; text content and organisation, text features) and context (Sub-themes; word meaning, and arrangement of letters to spell words).

Theme	Sub-theme	Reading to Learn Assessing Writing Descriptor

1. Graphic features	Spelling	Spelling errors of unfamiliar words (dirty, bright, friend, yesterday, tomorrow), but the accurate spelling of known and sight words such as he, it, are, when, water, see, day, teacher, girl, school
	Punctuation	Mostly accurate especially period and capital letter at the beginning of a sentence, but incorrectly used in the middle of a sentence such as "I" and "The". Proper nouns poorly punctuated "leribe, morija"
	Text presentation	Appropriate margins, some bold texts, and parallelism that improved clarity and readability. Weak handwriting "aNd,Whatare SynoNyms?", poor spacing such as " alotbutshe" "hetookme totheshopbutboughtmeanew" no modifier placement such as poor use of adverbs and adjectives before nouns and verbs such as "I have friend"
2. Grammar	Sentence patterns	Lack of cohesion in sentences such as "I have a friend in Eswatini but in South Africa" "The play food The go".
	Grammatical conventions	Subject and verb mostly do not agree in terms of number (singular, plural) such as "I likes". Incomplete sentences "Alicia reads a lot but she is not good at"
	Sentence and word groupings	Poor subject and predicate in sentences and subject complements "clever bright, the sleep". Lack of noun groups such as poor use of articles, adjectives, and possessives centered around the noun "I am a Mosotho.". Poor verb groups
3. Discourse	Text content and organisation	Headings of classwork and assignments are clearly written "My School, Antonyms, Complete with correct conjunctions". A bit of correct spelling and punctuation in sentences.
	Text features	There is correct numbering and bulleting to support content and provide context of the written text. There is cohesion and coherence through use of proper conjunctions in sentences such as "Do you want bread or pap?, John likes to go skiing but he is afraid of falling."
4. Context	Word meanings in sentences	Some understood use of conjunctions in sentences such as "but, or and", the majority misused "yet". For example, "Do you want bread yet pap?"

Table 4. An Analysis of Deaf ESL Learners' Written ESL Books

Table 4 presents an analysis of deaf ESL grade 7 learners. Based on this table, it is demonstrated that deaf ESL learners have difficulty writing correct spelling of unfamiliar words such as "*dirty*, *bright, yesterday, friend"*. These are words with sounds that need to be heard to be correctly written. They appear not to be challenged with the spelling of new words, but also struggle with punctuation marks, especially when required to punctuate in the middle of a sentence *"leribe".*

Apart from this, deaf ESL learners write words and sentences with improper organisation with no modifiers before nouns and verbs such as *"the play the food"*. In addition to this, their grammatical conventions are also poor, whereby the subject and the verb do not agree in terms of number (singularity and plurality) *"I likes".* However, they do portray excellent text features where they can correctly copy headings of their ESL tasks and dates.

Despite this, it is evident above that they write sentences that resemble the sign language grammar syntax *"me Mosotho".* This shows that they have limited ESL vocabulary in word meanings, particularly those related to using correctly only the conjunctions they use on a daily and get those that they are not familiar with incorrect in sentences such as "do you want bread *yet papa",* but correctly used *"but, and, or"* in sentences. In essence, they misuse complex grammatical constructions denoted by poor subject and predicate in sentences "clever bright, the sleep". However, some of their text organisation is good with appropriate margins for some, while poor spacing and lack of modifier placement for some *"aNd, whatareSynonyms.*

In light of the aforementioned, it can be concluded that the grade 7 deaf ESL learners' current writing proficiency in ESL is related to their inability to spell unfamiliar terms correctly, their failure to use punctuation to separate ideas, their poor use of ESL grammar, and their deficiency in vocabulary. However, it is important to keep in mind that this may be subjective and may not exactly depict the difficulties learners encounter while writing in ESL. The poor writing of deaf grade 7 ESL learners may have been caused by numerous factors. Consequently, impartiality is required for reliable identification of the existing writing proficiency of deaf ESL learners; thus, a pretest was administered by the researcher to ensure legitimate results, which are reported below.

4.2.1.2 Quantitative data Results

4.2.1.2.1Hammil & Larsen's (2021) Test of Written Language 4-th Edition Pre-test

As previously stated, to plan for TCA as an intervention, it was necessary to conduct a pre-test in addition to a portfolio assessment to fully and objectively determine the deaf ESL learners' present writing skills in ESL. Thus, the pre-test gave the researcher a baseline (Datatab, 2022) on which areas to focus on and emphasise during the intervention. This test consisted of 2 subsets (subset 1 through 5 and subset 6). Subsets 1 through 5 represent conventional, linguistic, and conceptual components of writing (See Appendix 12), while Subsets 6 demonstrates language skills (spelling, vocabulary, punctuation, sentence combining, logical sentences, and contextual norms) through impromptu writing. All sets of this test were over 30, whereby Subset 1 through 5 was 25, and impromptu writing (Subset 6) covered only 5. The presented marks are percentages.

4.2.1.2.1.1 Subset 1 through 5

The age and gender of the deaf ESL learners are indicated by their pretest scores in Table 4.3. Notably, the deaf ESL learners' identities have been withheld to observe confidentiality. Letter B represents boys, and Letter G represents girls.

Deaf ESL Girls' Names	Age	TOWL scores	Deaf ESL Boys' Names	Age	TOWL Scores
A	14	20%	D	12	16%
B	15	48%	E	13	12%
XII	17	24%	F	14	8%
0	16	24	G	17	44%
P	17	4%	H	17	28%
Q	20	4%	I	12	32%
S	17	24%	J	15	8%
T	15	12%	K	16	20%
Y	21	12%	L	16	20%
Z	20	0%	M	17	24%
II	12	48%	N	12	20%
IX	13	40%	R	18	12%
			U	15	40%
			V	18	12%

	W	19	0%
	C	17	0%
	X	19	8%
	XI	17	4%

Table 5. Deaf ESL Learners’ TOWL Pre-test

Table 5 displays the results of the TOWL pre-test. As was previously indicated, the researcher administered this test to determine the existing writing abilities of the grade seven deaf ESL learners. The majority of deaf ESL learners received poorer scores in relation to this table. The highest mark is one obtained by Learners B and II of 48%. This may imply that these are learners whose spelling, grammar, vocabulary, contextual, and conventional forms of written language are a bit better than the rest of other learners. There is also 0% for various learners (Learner W, X, Z). However, age differences and gender may portray writing difficulties for such learners. Precisely, to offer thorough insights into deaf ESL learners’ performance, descriptive statistics is used to help organise the above marks and summarise them to identify the current level of writing for the deaf. Kaliyan & Kulkami (2019) explain that descriptive statistics give a summary of sample data without drawing inferences based on probability theory.

Therefore, since the number of girls was not equal to that of boys, the central tendency and dispersion measures were distributed separately for each gender, comparing the different age groups (12 to 16 and 17 to 21) of each gender. The measures of central tendency used are the mean, median, and standard deviation to measure the variability of pre-test scores. While the mean provides a measure of the average performance of learners, the median is the middle value indicating central scores that separate higher and lower pre-test scores, and standard deviation provides a more interpretable measure of dispersion, providing insights on how spread-out scores are around the mean (Crad Coach, 2020; Datatab, 2022).

Gender	Measures of central tendency	Measures of dispersion

	Mean	*Median*	*Standard deviation*
Girls - 12-16	32.00	32	15.39
-17-21	11	8	10.56
Boys - 12-16	19.56	20	10.67
-17-21	14.67	12	14.70

Table 6. Deaf ESL Pre-test Scores

As presented in Table 6 above, it is evident that although all performed poorly in writing tasks, the younger deaf ESL learners appear to have performed better than older deaf ESL girls with a 32.00 mean, while those of older deaf ESL learners are at 11. These lower average scores of girls may mean that their written work was full of discrepancies associated with poor sentence structures, limited ESL vocabulary, poor presentation of written work, and lack of ESL grammar. Similarly, the younger deaf ESL boys also outperformed older deaf ESL boys with a mean of 19.56 against 14. 67. It may be agreed that the older deaf learners' cognitive changes associated with growing up may have impacted their memory, speed, and overall cognitive function hence producing incomprehensive writing.

Additionally, the middle value for smaller girls, which indicates a central score that separates higher and lower scores is also higher than that of older deaf ESL girls. While their central score is 32, that of 17-21-year-old girls is 8. The same also applies to smaller deaf ESL boys with a median value of 20 against those of older boys which is 12. It may be incurred that these lowered central scores of older deaf ESL learners may mean that they may have developed certain habits or patterns in their communication style that could potentially influence how they approach their writing tasks. These are such writing that mixes the two languages' grammar, is poorly punctuated, and lacks contextual and conventional forms of exact ESL grammar.

Lastly, the younger deaf ESL girls' scores are dispersed around the mean with 15.39, and 10.56 for 17-21 older girls. This is a higher value for younger ESL girls, than the older deaf ESL girls.

However, this is not the same for younger deaf ESL boys, because the 17-21's scores are spread out around the mean with a higher value of 14.70 than the 12-16-year-olds deaf ESL boys' value of 10.67. The higher standard deviation for 12-16-year-old deaf ESL girls and 17-21-year-old deaf ESL boys means that there is greater diversity in writing level. This implies that some groups of smaller deaf ESL girls and older deaf ESL boys performed better, while some of them lagged. The lower dispersion signifies that the older deaf ESL girls and younger deaf ESL boys' means clustered around the mean, indicating less variability in their writing. The lower standard deviation means that there is consistency in learners' marks which may mean that their writing work lacked vocabulary, hence similar performance. Also, the difficulties with grammar rules and structure may have limited such deaf ESL learners to express themselves effectively in writing.

4.2.1.2.1.2 Subset 6 Pre-test scores

In this subset of Hammil and Larsen's TOWL, I put the picture on the board and went around the classroom showing the picture individually to all deaf ESL learners, explaining the instructions in exact ESL grammar and exact sign language grammar for all to get the instructions. This is where I targeted for ESL language skills in this "impromptu" writing, such as spelling, vocabulary, punctuation, sentence combining, logical sentences, and contextual norms.

Figure 6. A picture used in impromptu writing

Above is a picture that deaf ESL learners were to write about, where learners were to show their language skills in writing in ESL. Following are some of the sentences they wrote.

"Mrs Mothae of all the sokfim. It is bay is the schael. They is. They sokemfi. Today Moseisknes" (Appendix 13)

"The are school to help speaking English. My mother speaking English, boy help me today. You classboy friendly Read help come Teacher is all tech always. Always tech Read English" (Appendix 14)

"I see teacher teaching the kids and I see the kids riding the books" (Appendix 15)

"The picture I ice teacher, chilrens and clss teacher and chilrens" (Appendix 16)

"I raet are books siting in chre" (Appendix 17)

Based on the above verbatim transcriptions, it is ostensible that the deaf ESL learners are faced with exact ESL grammar, writing sentences with no subject-verb agreement. Their sentences mostly have distorted syntax such as *"The are school to help speaking" "They is"*. This does not only show poor sentence grammar, but also denotes lack of English vocabulary. Most words as evident above are wrongly spelt such as "riding" instead of *"reading" "chilrens"* instead of *"children" "schael"* instead of *"school"*. Further, the sentence *"Mrs Mothae of all the sokfim"* denotes poor and limited ESL vocabulary. The deaf ESL appear to know how to write only words they are familiar with such as teacher, kids, books, and picture.

All in all, from document analysis and pre-test scores of deaf ESL learners, it is evident that the challenges that deaf learners face in writing in ESL are those related to ESL grammar, vocabulary, and spelling.

4.2.2 What communication modalities can be employed through TCA to develop deaf ESL learners' writing skills in ESL?

To address this question, the researcher employed three data generation tools to get more robust conclusions and insights into the communication modalities she could employ to develop deaf learners' writing skills. These three tools assisted in eliminating research biases since FGDs were conducted on deaf ESL learners, in-depth interviews with ESL teachers, and structured observations by the researcher herself. Therefore, this section commences with FGDs to provide the language and communication background of deaf ESL learners, which helped the researcher to identify the TCA strategies to employ.

4.2.2.1 Qualitative data

As a reminder, two qualitative data generation tools were employed to generate data: FGDs and in-depth interviews.

4.2.2.1.1 FGD

The Rose (2005) Assessing Writing tool was used to analyse the lexical and grammatical choices of deaf ESL learners because they are among the underprivileged, marginalised, or indigenous group of learners with their language grammar. This instrument aided in revealing the semantic concepts at play. That is, I was able to determine the modalities to use in TCA in the classroom to support deaf ESL learners who are writing in ESL by comprehending the semantic implications of their responses. I investigated and examined their answers as syntactic and formal objects (YOUNG, 2009). These are the same texts that were supposed to reveal culture in social circumstances by incorporating the context-specific meaning of deaf ESL learners as drawn from a "wide spectrum of language, cultural, and educational background," (Rose, 2005.p. 132). To help comprehend this, the table below explains how the themes that were created were selected based on:

Lexical development	**Syntactic development**		
Lexical choices	*Grammatical choices*		
	Phrase	Text	Context
Functions of language to convey meaning.	Organisation of words within sentences.	Understanding discourse structure	Cultural, social, and individual experiences
Vocabulary and word choice.			

Table 7. Reading to Learn Assessing writing tool guide for analysis

Table 7 above presents a tool employed in analysing deaf ESL learners' FGDs. This helped in analysing the deaf ESL learners' verbatim transcription, as several concepts may not be explicitly understood. Consequently, Rose's (2005) analytic tool assisted in revealing the contextual meanings through the grammatical and lexical choices of the deaf ESL learners' responses, or the meanings hidden within those choices. Specifically, the analysis looked at how the learners' choice of vocabulary, discourse structure, and contextual considerations embedded within their language and communication background helped identify the modalities that might enable them to write proficiently in ESL.

According to Rose (2005), for contextual or semantic meanings to be uncovered, one has to evaluate vocabulary, word choice, discourse structure, and the respondents' experiences. Thus, the evaluation of the deaf ESL learners' verbatim transcription of their exact sign language grammar was based on the functions of their language conveyed in their lexical choices and grammatical choices as noted by T. Mataka (personal communication, June 14 2024), hence assisted in designing instructional strategies accordingly. Below is the FGDs' transcription, followed by a detailed analysis.

Figure 7. Deaf ESL Learners' FGDs

The FGDs above were conducted in the presence of a deaf ESL teacher to ensure that the deaf culture is observed as well as to lower the participants' affective filters. Batista & Garcia (2023) propound that having someone who understands deaf culture helps enhance understanding and empathy towards the experiences, challenges, and perspectives of deaf ESL learners. Given that the sample of deaf ESL learners included those who were mentally retarded, the use of a laptop was to enhance inclusivity, as Hamilton (2011) explains that such learners tend to have limited attention span. To ensure thorough exploration without overwhelming deaf ESL learners, the FGDs consisted of 10 questions per group (see Appendix seven).

From those questions, the following are some of the transcriptions, from which the themes (see table 8 below) were derived:

> *"Sign language only" "sign before people me scared" "teacher" "videos me love" "pictures" "talk class me scared" "English" "me don't like" "English and sign language" "singing" "teacher spelling bee" "me don't like" "play soccer" "me don't understand hearing people" "facial expression teacher help" "Pictures" "No" "Never" "English difficult" "challenges nothing" "comfortable" "name mine write"*

The transcriptions above represent a variety of answers that deaf ESL learners provided in response to questions concerning their language and communication background. These questions included what their main form of communication was at home, their educational background, the resources that helped them write in ESL, and the difficulties they encountered when interacting with people from hearing cultures. It appears that the motifs (see Table 4.4) are taken directly from these transcriptions. Specifically, Rose's (2005) technique supported my discovery of TCA modalities to use in class by helping me unearth the semantic significance hidden in those transcriptions.

	Assessing Writing Tool Descriptor	
Theme	***Lexical choice***	***Grammatical choice***
Language development	Use content words and smaller vocabulary size words such as me, teacher, friend	Adapt linguistic rules (English difficult, play soccer, sign language only)
	Frequent word usage of familiar words (help, don't know, friend)	Exhibit syntactic complexity a bit similar to hearing learners (play soccer, teacher spelling bee)
Communication preferences	Use of sign language-derived words and use of concrete vocabulary (pictures, videos, soccer)	Use clear and concise sentence structures (videos me love, me don't know, English difficult, Words English difficult write, challenges nothing) and use

		descriptive sentences (sign before people me scared)
Cultural considerations	Use of specific terms that hold deaf culture significance (love, scared, play) Prefer descriptive terms that evoke visual imagery to convey abstract concepts (scared, play, love)	Direct translation of sign language grammar to responding to questions (me don't know, talk class me scared) Directness, politeness conventions prevalent in deaf culture (sign language only, videos me love)
Educational history	Those from oralist era used more simplified vocabulary (talk, English, Singing) manualist era used rich vocabulary (scared, comfortable, never)	Oralist era used shorter sentences (English and sign language) manualist a bit complex sentences (facial expressions teacher use help, me don't understand hearing, sign before people me scared)
Communication challenges	Limited vocabulary, not able to use correct words to express themselves (don't know, No) difficulty in using abstract words, interpret words literally (comfortable, challenges)	Syntax difference, verb tense and aspect markers, misuse of subjective, objective, and possessive pronouns (name mine write, friend me love), struggle with complex sentence structures (me don't understand hearing people, facial expression teacher use help)

Table 8. An Analysis of Deaf ESL Learners' FGDs

Table 8 above provides an analysis of deaf ESL learners' FGDs, showing themes derived. These are themes that guided the identification of communication modalities to employ in TCA. This is because, by listening to the voices of those directly impacted by hearing loss, developing instructional strategies that best fit their unique needs and enhance their second language learning is crucial (Hassanzaden & Nikhoo, 2019). Therefore, based on this table, it is shown that deaf ESL learners' lexical and grammatical choices show that language development should be taken into consideration in designing instructional strategies, specifically looking at their use of content words, smaller size vocabulary adapting linguistic rules, and exhibiting syntactic complexity.

In their lexical and syntactic choices, as evident above the deaf ESL learners' use of only content words and smaller vocabulary imply that the deaf need interest arousing multimedia resources. This is because that they adapt linguistic rules of their mother tongue such as *"English difficult"* as evident above. Further, they also use sign language-derived words in clear and concise sentences *"videos me love"*. This shows that they may need a stronger preference for infographics to help them avoid using succinct and simple phrases.

Additionally, their lexical and syntactic choices show that some of them are from oralist and manualist era. Those from oralist era use more simplified vocabulary *"don't know, no"* and shorter sentences *"English and sign language"*, while those from manualist era use richer vocabulary *"challenges"* and complex sentences *"me English don't understand"*. Thus, it seems reasonable to assume that the modalities to help such learners should be different to cater for their educational history.

Such learners either from manualist or oralist era do have limited vocabulary because they are not able to use correct words to express themselves *"no, don't know"*. They also showed difficulties in using abstract words, hence ending up interpreting words literally *"comfortable, challenges"*. All in all, their lexical and syntactic choices portray particular terminology that conveys their cultural importance *"me don't know" "videos me love"*. These are direct sign language grammar. This implies that designing instructional strategies ought to recognize the significance of deaf ESL learners' culture.

4.2.2.1.2 In-depth interviews

As previously stated, data from in-depth interviews should be used to confirm data gathered from classroom observations. According to Denzin (1989), classroom observation data may offer a limited perspective on the nuances of the learning process because it largely focuses on the actions and performance of the teachers in the classroom. This could therefore restrict the breadth or fail to fully represent the intricacies of the learning process. The observation extract on the identification of communication modalities to use in the classroom was validated using in-depth interviews (see Appendix 18 for in-depth interview questions).

Most importantly, the observations were unable to take into consideration the contextual elements that affect the modality selection used to improve the writing abilities of deaf ESL learners. Consequently, the in-depth interviews helped to identify the contextual elements associated with the experiences and difficulties ESL teachers have when instructing ESL learners in writing. Consequently, the following Atlas.ti software network illustrates how contextual factors impact each of the selected codes that were taken from the interview responses:

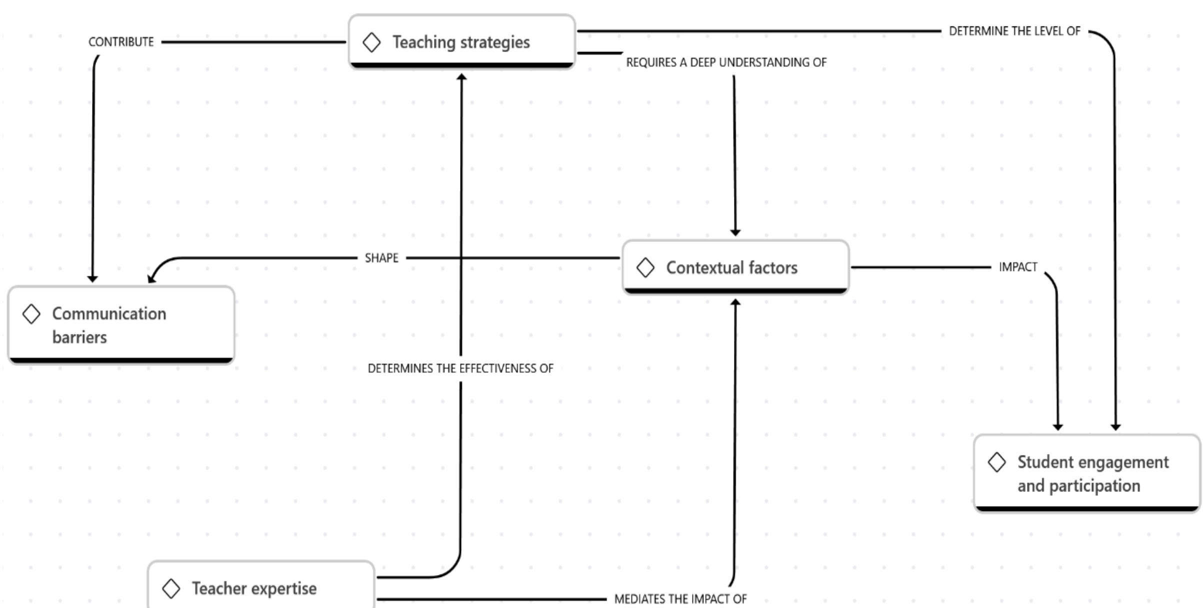

Figure 8. In-depth interview network

Figure 8 shows the network that was extracted from deaf ESL teachers' responses in in-depth interviews. As evident above, their responses included contextual elements as the core code, from which other codes are extracted. To be specific, the contextual factors including deaf culture, the learning environment, and classroom design were discovered from teachers' responses to enhance their learners' engagement and participation. Some of these include the classroom setting, the demographics of the learners, and the resources that were available for instruction. It was discovered some of their experiences have an impact on the teaching strategies they use since; to effectively meet communication demands, they do require some specific knowledge. The difficulties with hearing, which are all caused by environmental factors, are another problem discovered in their responses. In other words, to determine the communication modalities to teach the deaf, there is a need for knowledge of the challenges the deaf ESL learners go through. Last but not least, since those modalities do influence the learning experiences, successful approaches are developed based on specific concepts or principles. Figure 9 presents a thorough presentation of a network presented above, showing teachers’ responses.

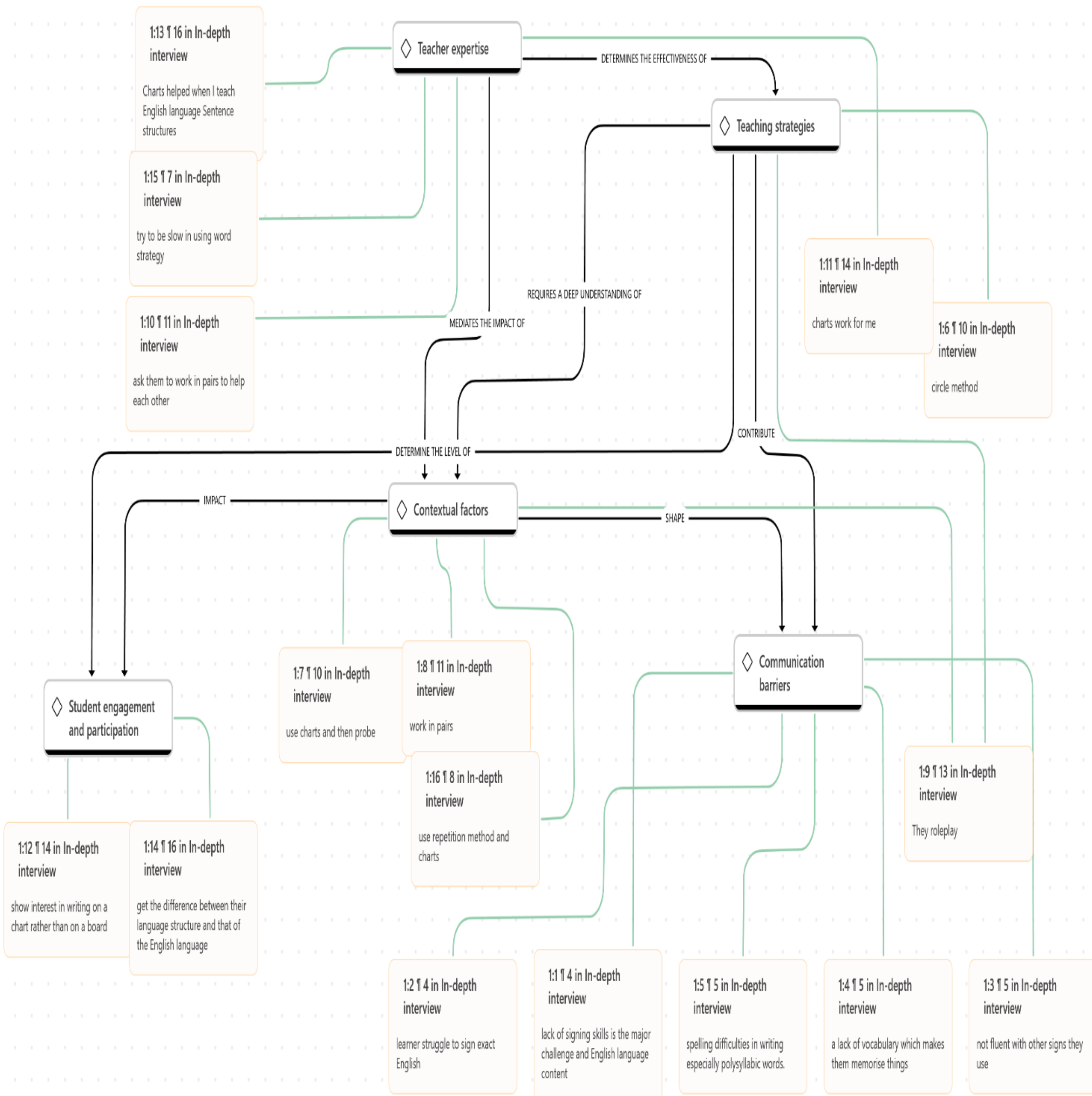

Figure 9 In-depth interview analysis of teachers' responses

Based on teachers' responses, the above figure illustrates how important it is to consider teacher expertise, learner engagement and participation, and communication barriers when determining which communication modalities to use in TCA to improve the writing skills of deaf ESL learners. In their responses, contextual factors such as the availability of charts, learners' role-playing, and repetition methods appeared to have shaped the communication barriers in class. The teachers' use of the repetition method appears to have contributed to deaf ESL learners' struggle to sign exact ESL due to a lack of signing skills. Thus, a lack of vocabulary causes them to memorise things.

Despite this, in their responses, they showed that their expertise such as knowledge that charts help in writing ESL sentences, and their being slow in word strategy and employing peer tutoring determined the effectiveness of their method of delivering writing content simultaneously mediating the impact of deaf ESL learners' engagement. They stated that their deaf ESL learners are highly engaged when required to write ESL sentences on a chart rather than on a board. The use of charts appeared to have incited their interest in learning to write ESL sentences since they write in bold on a coloured chart, hence getting the difference between the exact ESL grammar and that of their native language

4.2.2.2 Quantitative data results

For this particular section, Structured Classroom Observations were used.

4.2.2.2.1 Structured Observations

To validate the findings from deaf ESL learners' FGDs, and deaf ESL teachers' in-depth interviews, "descriptive systems" from structured observations were conducted by the researcher. For this structured observation, the set of items to observe was pre-determined. Seemingly, this observation was divided into two stages, according to the purposes of analysis, and assisted with the creation of written descriptions (Weade & Evertson, 1991) of the deaf ESL teacher's teaching of writing, which was considered more particular and detailed. Firstly, it was to unveil the circumstances, and communication modalities to be specific where a teacher teaches writing. Secondly, the observations validate the in-depth interviews of deaf ESL teachers. The qualitative data generated from in-depth interviews guided the structuring of the observation checklist. Hence, its work is not entirely to identify strategies to use in TCA, but to diagnose the strategies to use, and will later be used to detect if there was any transformation.

The section below provides a Likert scale from teachers' in-depth interviews. For clarity, since teachers mentioned the modalities they used, it was imperative to first observe frequency counts and duration measurements of the modalities they used. Firstly, in frequency, I tracked how often certain modalities were used in teaching. Secondly, in duration measurements, I assessed how long each is employed during instructional time.

Given the structured nature of the data gathered from structured observations, systematic recording of specific behaviors/interactions in the classroom behavior was necessary to enable valuable insights into identifying communication modalities. Guided by Appendix nine, the chart below condensed the structured observation checklist into understandable summaries of the observed behavior in this diagnostic phase. As a result, to prevent observer bias, also known as the Hawthorne effect, the teacher was told that the observer studies learners' interaction rather than the actual purpose of observation. On a set of items on a checklist, never indicate that item is not used at all, sometimes (item used occasionally, not consistently), and always (consistently used in every relevant teaching situation). For the duration, short when an item is used for 0-30% of lesson time, moderate when an item is used for 33- 67%, and long when the item is used for 68%-100% of lesson time. I conducted two observations.

No.	Criteria	Frequency counts			Duration measurement		
		Never	Sometimes	Always	Short	Moderate	Long
1	**Visual cues**		✓ ✓		✓	✓	
	-Are visual cues used effectively during communication?						
	-Are sign language and gestures clear and easy to understand?	✓	✓		✓	✓	
	-Do visual cues support understanding of written language?	✓	✓		✓	✓	
2	**Engagement**	✓ ✓			✓ ✓		
	-Is there active engagement between the teacher and deaf ESL learners?						
	-Are there opportunities for deaf ESL learners to ask questions or seek clarification?	✓ ✓			✓ ✓		
	-Is feedback provided constructively?	✓ ✓			✓ ✓		
3	**Use of technology**	✓ ✓			✓ ✓		
	-Are technological tools integrated into communication?						

	-Are online resources used to enhance writing?	✓ ✓		✓ ✓	
	-How is technology leveraged to bridge the communication gap?	✓ ✓		✓ ✓	
4	**Writing activities**	✓ ✓		✓ ✓	
	-Are writing activities tailored to deaf ESL learners' needs and preferences?				
	-Are writing skills reinforced through practical application?	✓ ✓		✓ ✓	
	- Are writing tasks accessible and appealing for deaf ESL learners?	✓ ✓		✓ ✓	
5	**Collaboration**	✓	✓	✓	✓
	-Are learning strategies shared and coordinated to ensure a holistic approach?				
	- Is there engagement between the teacher, the deaf ESL learners, and the writing content?	✓ ✓		✓ ✓	
	--Is there engagement and interest among deaf ESL learners?	✓ ✓		✓ ✓	
6	**Environment**	✓ ✓		✓ ✓	
	- Is the learning environment conducive to effective communication and writing development?				
	- Are distractions minimised to facilitate focused learning?	✓ ✓		✓ ✓	
	- Does physical space support the use of various communication modalities/	✓ ✓		✓ ✓	

Table 9. Structured Classroom Observation of deaf ESL teacher teaching writing in ESL

The above table presents an observation checklist for the first observation of a deaf ESL teacher in her teaching of writing in ESL. There were six criteria from which under each criterion were three items. All of the items were rated for frequency and duration measurement. All criteria have uniform range indicating that in the teaching of writing, there was no engagement, no technology integration, writing activities never tailored to deaf ESL learners' needs and overall learning environment was not conducive for effective learning of writing in ESL. These were denoted by frequency counts *"never"* and duration *"short"* for all criteria. However, visual cues were observed used *"moderately"*, and in the two observations, hence learning strategies were able to be shared and coordinated to ensure a holistic approach.

Drawing on the findings from the Reading to Learn Assessing Writing Tool (from FGDs) and Atlas. ti software (In-depth interviews), the communication modalities to be employed in TCA are sign language to provide visual and gestural modality, lip-reading so that deaf ESL learners observe lip movements to understand spoken language, infographics, and written texts, written materials and gestures to provide non-verbal communication. All these were said to cater to the individual needs of deaf learners, especially when the study sample includes even those who are mentally retarded deaf ESL learners. Quantitative data from structured observation offered objective evidence regarding which strategies are being utilized and their effectiveness in engaging learners.

4.3 TRANSFORMATIVE PHASE

In this phase of PAR, only one question was used to show transformation of deaf learners and three data generation tools were used to address this section. That is, the qualitative DA and quantitative measures were provided in structured observations and post test scores.

4.3.1 How does the implementation of TCA improve deaf ESL learners' writing skills?

Given the results from the diagnostic phase, specifically those from document analysis and pre-test scores, that demonstrate that deaf ESL learners are faced with writing skills challenges related to ESL grammar, ESL vocabulary, and ESL spelling, this transformative phase is mainly on the start of an intervention, where both learners and I implement Total Communication Approach to develop the aforementioned difficulties in writing. This in other words is to determine the effectiveness of TCA. Thus, within the teaching using TCA strategies, I examined deaf ESL learners' books (portfolio assessment) to effectively examine the effectiveness of TCA. Following, the pretest and post-intervention scores of deaf ESL learners of different age groups and genders are presented using descriptive statistics: measures of central tendency (mean and median) and measures of dispersion (standard deviation). Structured observation is also used to determine the effectiveness of TCA in developing deaf learners' writing abilities. Document Analysis on learners' books forms the first section of the data presentation on this phase:

4.3.1.1 Qualitative phase findings

4.3.1.1.1 Document Analysis

This section presents a portfolio assessment of deaf ESL learners' books. This shows the collection of their writing in ESL when taught with TCA. It was imperative to conduct a DA to evaluate the effectiveness of TCA because DA was also used as a baseline on past books of deaf ESL learners. Below is a presentation of current writing in ESL for deaf ESL learners when intervened with TCA.

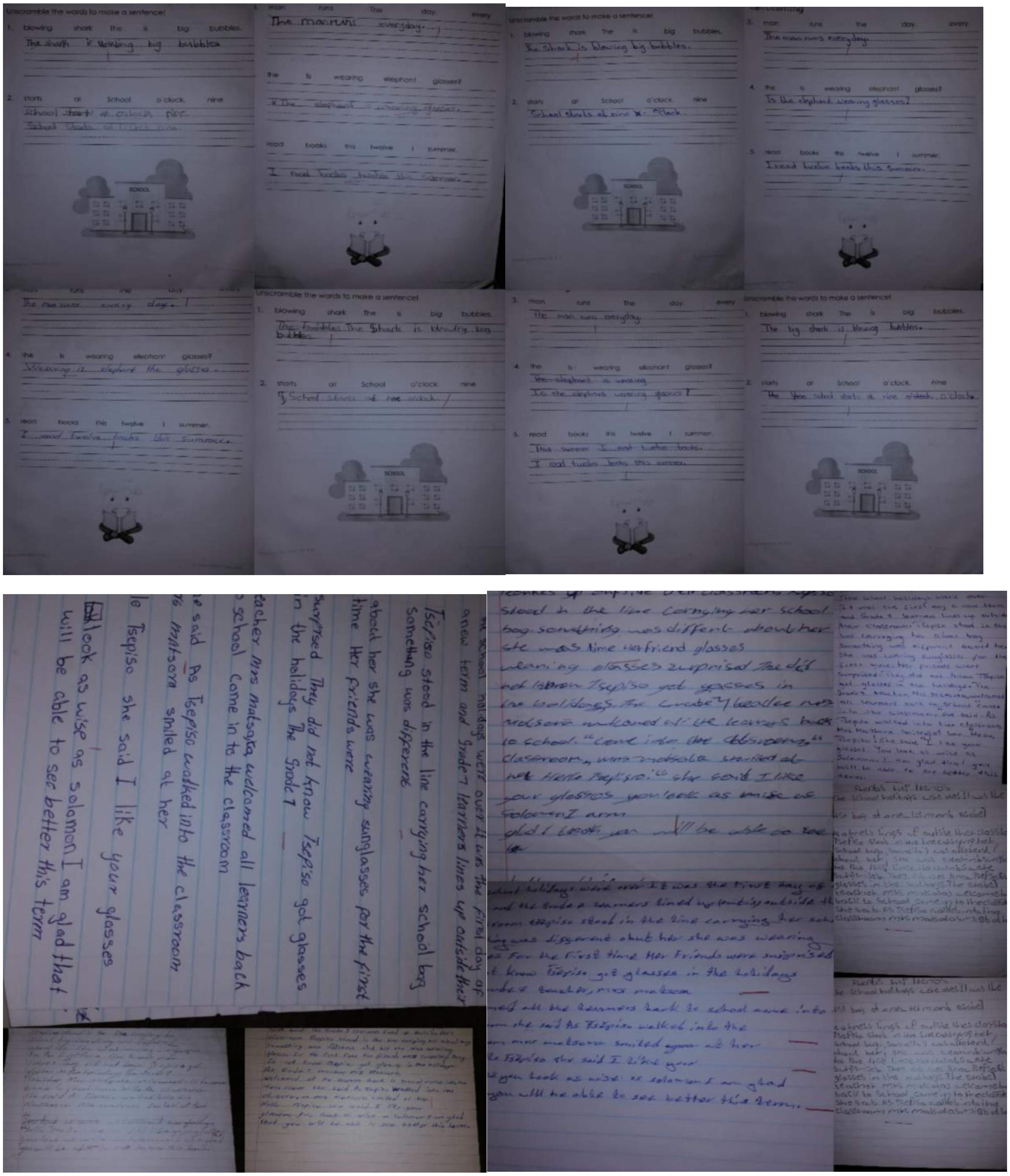

Figure 10. Presentation of current writing for deaf ESL learners

Figure 10 above shows deaf ESL learners' current writing when taught with TCA. Similar to the diagnostic phase, I examined graphic features of their written text, grammar, discourse, and context. A thorough analysis is presented in Table 10 below:

Theme	Sub-theme	Reading to Learn Assessing Writing Descriptor
1. Graphic features	Spelling	The appropriate spelling of known and sight words such as “he”, “it”, “mother”, and “school”. Enhanced phonological awareness in ability to recognise and manipulate sounds such as “welcomed” “blowing”
	Punctuation	Mostly accurate, especially period and capital letters at the beginning of a sentence especially those interrogative sentences such as “Is the elephant wearing glasses?”. Proper nouns are correctly punctuated even when used in the middle of the sentence “He said as Tsepiso walked into the classroom.”, “Look as wise as Solomon..”
	Text presentation	Appropriate margins, some bold texts, and parallelism improved clarity and readability. Improved handwriting denoted by use of appropriate capitalisation of words. Poor spacing such as “ herfriendsweresurpsised” “thegrade7teachermrsMatsoara”. There are modifier placements such as proper use of adverbs and adjectives before nouns and verbs such as “The big shark”
2. Grammar	Sentence patterns	Cohesion in sentences such as “School starts at nine o’clock.” “She asked as Tsepiso walked into the classroom.”
	Grammatical conventions	Subject and verb mostly agree in terms of number (singular, plural) such as “twelve books” and “the man runs”. More complete sentences with correct punctuation“Hello Tsepiso” She said. “I like your smile”. Ability to unscramble words to create coherent sentences from “the Is wearing elephant glasses?” To “Is the elephant wearing glasses?”. From “ starts at school o’clock nine” to “The school starts at nine o’clock.”. From “man runs The day. Every” to “The man runs everyday.”
	Sentence and word groupings	Enhanced subject and predicate in sentences and subject complements “I like your glasses” and “I read twelve books this summer.”. Noun groups such as proper use of articles, adjectives, and possessives centered around the noun “..the first day of a new term” “the grade 7 learners stood outside their classroom.”
3. Discourse	Text content and organisation	Headings of classwork and assignments are written: “Friends help friends”. A bit of correct spelling and punctuation in sentences.
	Text features	There is correct numbering and bulleting to support content and provide context for the written text. There is cohesion and coherence

		through the use of proper conjunctions and figures of speech in sentences such as "You look as wise as Solomon"
4. Context	Word meanings in sentences	Some understood the use of unfamiliar words to construct coherent sentences such as "The big shark is blowing bubbles."

Table 10. Analysis of deaf ESL learners' current writing

Based on the above table, it is demonstrated that deaf ESL learners' writing consists of appropriate graphic features particularly related to the appropriate spelling of known and sight words such as *"he, it, mother, school"*. They also signify phonological awareness in their ability to recognize and manipulate sounds such as *"welcomed"* and *"blowing"*. This denotes that deaf ESL learners show that after TCA, deaf ESL learners' writing is signified by a rich lexicon.

Additionally, most deaf ESL learners' work is accurately punctuated, especially the interrogative sentence *"Is the elephant wearing glasses?"* and proper punctuation of proper nouns. There are also appropriate margins, bold texts, and parallelism that improve clarity and readability. However, there appears to be no spacing in some of their written work such as *"herfriendsweresurprised"*. Precisely, there appear to be modifiers through the use of proper adverbs and adjectives before nouns and verbs such as *"The big shark"*.

Secondly, due to TCA strategies, it is shown that there is improvement in grammar. The deaf ESL learners write cohesive sentences *"School starts at nine o'clock"*. This at the same time denotes grammatical conventions' improvement in terms of number in terms of singularity and plurality *"twelve books"* and *"the man runs"*. Equally important, they demonstrated the ability to unscramble the scrambled sentences to construct coherent sentences from *"the is wearing elephant glasses?"* to *"Is the elephant wearing glasses?"*. Further, in the sentences they wrote that portray enhanced subject and predicate and subject complements *"I like your glasses"*, thus showing the ability to use articles, adjectives, and possessives centered around the noun.

Thirdly, text organization and content, similar to the diagnostic phase, deaf ESL learners can copy headings and classworks assignments *"Friends help friends"*. However, it shows that some sentences are incorrectly punctuated. For instance, some sentences do not end with a period at the end of a sentence, while there is a mastery of capitalization of proper nouns, correct bulleting, and numbering to provide content and context for written text. Additionally, cohesion and coherence are also ostensible through the use of proper conjunctions and figures of speech *"You look as wise as Solomon."*

Lastly, deaf ESL learners demonstrated their capacity to understand the context of texts (word meanings in sentences). Some of them understood the use of unfamiliar words, particularly in unscrambling the written sentences, and hence ended up showing understanding of ESL vocabulary through the use of unfamiliar words such as *"the big shark"* and *"welcomed".*

4.3.1.2 Quantitative phase

Two data generation tools were used in this phase, the pre-test scores and structured participatory observations

4.3.1.2.1 Hammil and Larsen's TOWL Post-test

In presenting deaf ESL learners' test scores, it is worth noting that, since the number of deaf ESL girls is not equal to the number of deaf ESL boys, each set of data for each gender will be presented separately.

4.3.1.2.1.1Post-Test Results for Subset 1 through 5

4.3.1.2.1.1.1 Deaf girls pretest scores for subset 1 through 5

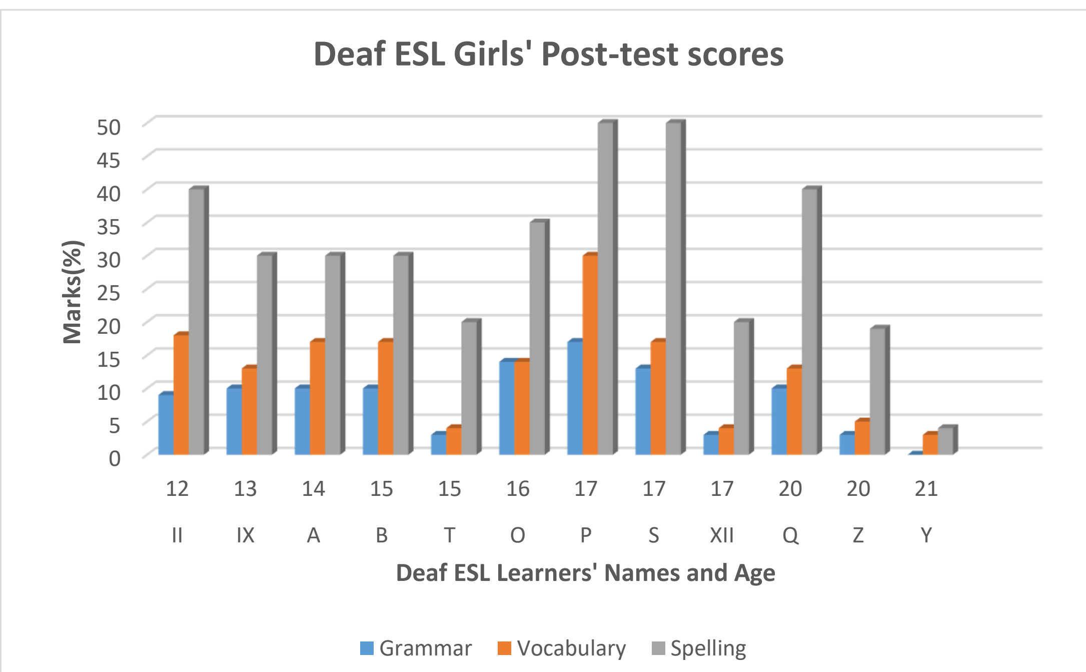

Figure 11. Deaf Girls pretest scores for Subset 1 through 5

The above bar charts demonstrate deaf ESL girls' post-test scores on writing skills (Grammar, Vocabulary, and spelling). These are the post-intervention scores. Evidently, Learner II (aged 12) got 67%, out of which scored 9% in grammar, 18% in vocabulary, and 40% in spelling. While Learner IX (13) scored 53%, of which 10% grammar, 13% vocabulary, and 30% spelling, Learner A (14) scored 57%, whereby 10% grammar, 17% vocabulary and 30% spelling, and Learner B (15) scored 57%, out of which 10% of it is correct grammar usage, 17% vocabulary and 30% spelling. Further, Learner O (16) got 63, whereby 14% marks correct ESL grammar usage, 14% vocabulary, and 35% correct spelling. Learner P (17) scored 97 %, 17% in grammar, 30% in vocabulary, 50%spelling, Learner S' (17) overall score in writing is 80%, out of which 13% in grammar, 17% in vocabulary, and 50% in spelling. On the other hand, Learner XII (17) got an overall mark of 27%, 3% correct grammar, 4% vocabulary, and 20% spelling while Learner Q (20) scored 63%, of which 10 is grammar usage, 13% vocabulary and 40% for correct spelling. Lastly, Learner Z (20) scored 27% in writing tasks, out of which 3% is for grammar, 5% for vocabulary, and 19% for spelling, and Learner Y (21) scored 7%, demonstrating no correct grammar usage (0%), 3% vocabulary and 4% correct spelling. It is therefore evident that those deaf ESL girls who are older than 18 years scored lower marks as compared to those lower, specifically those related to ESL grammar. This is evident in the above chart, where there are more scores for spelling for all deaf ESL girls than for vocabulary and grammar.

4.3.1.2.1.1.2 Deaf Boys' pretest scores for subset 1 through 5

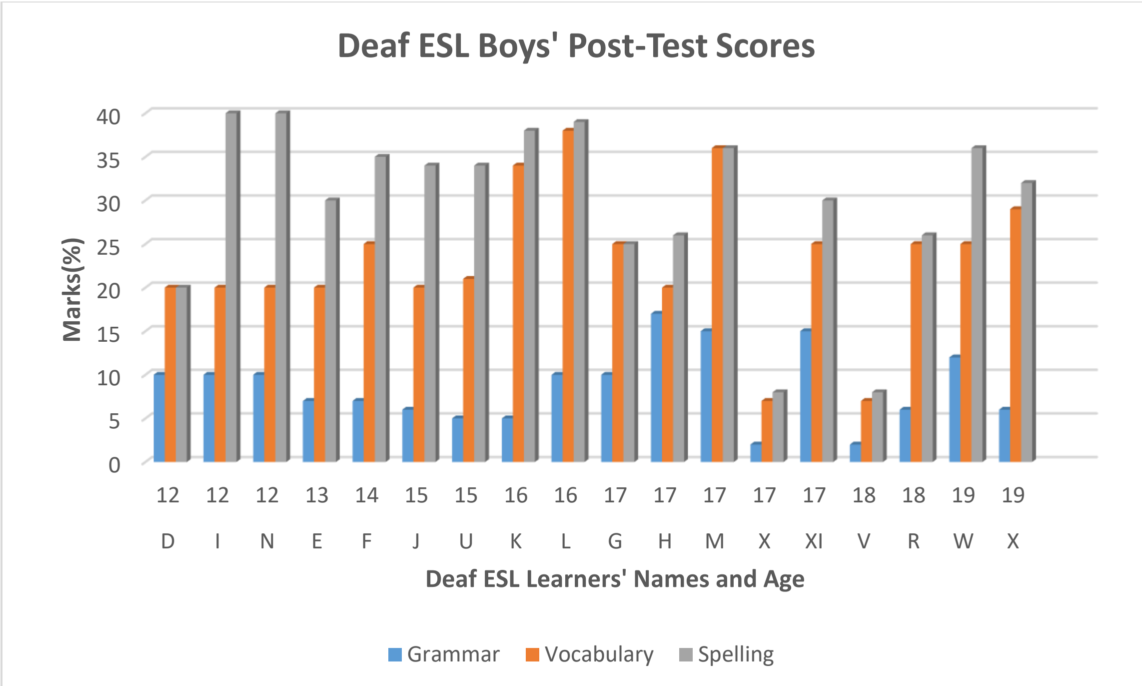

Figure 12. Deaf Boys Pre-test scores for Subset 1 through 5

This chart above deaf ESL boys' post-test scores on different writing abilities; grammar, vocabulary, and spelling. Based on this table, Learner D (aged 12) scored 50% out of which 10% marks correct grammar usage, 20% vocabulary, and 20% correct spelling. Learner I (12) got 70%, out of which 10% for grammar, 20% for vocabulary, and 40% for spelling, while Learner N (12) also scored 70% of which 10% is also for correct grammar usage, 20% also in vocabulary and 40% for spelling and Learner F (14), 7% grammar, 25% vocabulary, 35% spelling. Learner J's (15) overall score in writing is 60%, of which 6% is for grammar, 20% for vocabulary, and 34% for spelling. Learner U (15) got 60%, 5% grammar, 21% vocabulary, 34% spelling. Learner K (16) got 60%, of which 5% grammar, 34%, and 38% spelling while Learner L (16) scored 87% out of which 10% grammar, 38% vocabulary, and 39% spelling, and Learner G (17) got 605, of which 10% grammar, 25% vocabulary, 25% spelling. Learner H (17) scored 53%, 7% grammar, 20% vocabulary, and 26% spelling, Learner M (17) scored 87%, 15% grammar, 36% vocabulary, and 36% spelling, and Learner X (17) only scored 17%, 2% denoting correct grammar usage, 7% vocabulary and 8% spelling. Learner XI (17) got 70%, out of this percentage, 15% is correct ESL grammar, 25% vocabulary, and 30% spelling, while Learner V (18) scored 17%, 2% grammar, 7% vocabulary, and 8% spelling. Lastly, Learner R (18) got 57%, out of which 6% grammar, 25%

vocabulary, and 26% spelling, while Learner W (19) scored 83%, of which 12% grammar, 35% vocabulary, 36% spelling, and Learner X's (19) overall writing scores is 67%, of which 6% grammar, 29% vocabulary and 32% spelling. Based on these scores, it is apparent that, just like deaf ESL girls, even deaf ESL boys got most ESL words correct more than any other writing ability. However, there is only one deaf ESL boy who scored higher marks in ESL grammar than any other skill in writing. Unlike older deaf girls, deaf ESL boys scored even higher marks than older girls and other boys in vocabulary and spelling.

4.3.1.2.1.2 Post-test Results for Subset 6

This section of the transformative phase presents post-test scores for the second subset of the Hammil and Larsen Test of Written Language. This comprised of impromptu writing, whereby I showed all deaf ESL learners a picture, displayed it on coloured board, and went around in class showing all the deaf ESL the picture. From this picture, I assigned them to write what they see in the picture. My target was on language skills, specifically spelling, vocabulary, and ESL grammar. All these were expected to be denoted by correct use of punctuation marks, sentence combining, logical sentences, and contextual norms. This was marked out of 5.

4.3.1.2.1.2.1 Deaf Girls' post-test results

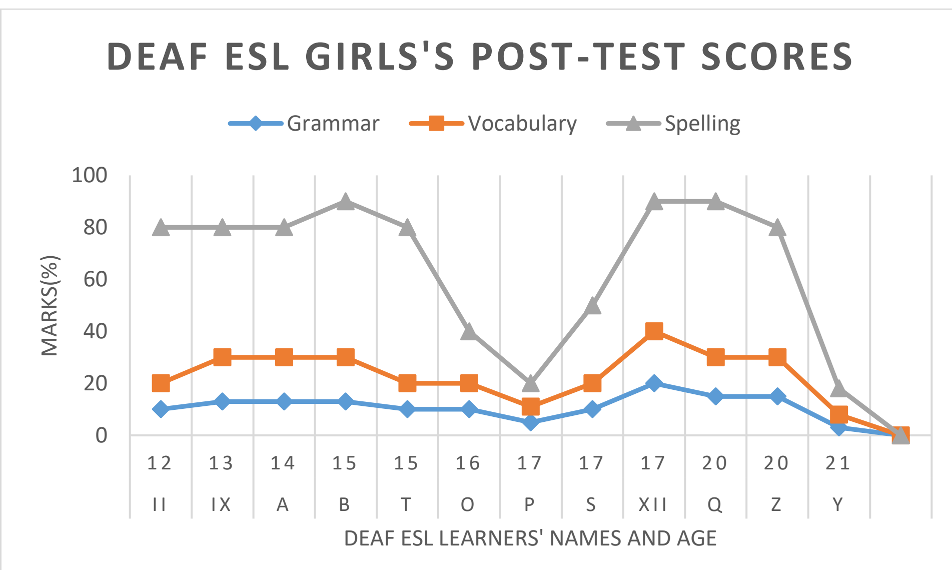

Figure 13. Subset 6 Scores for Deaf ESL Girls

The graph above demonstrates the test results for all 12 deaf girls. Out of these results, it is evident that most deaf ESL girls, about 4 obtained 80% as an overall total percentage in impromptu writing. However, there are varying percentages of this in terms of the skills that were to be developed such as Learner II (aged 12) scored 10% in grammar usage in writing an impromptu story, 10% for vocabulary in ESL, and 60% in spelling, while Learner IX (13) and Learner A (14) have similar scores of 13% in grammar, 17% vocabulary, and 50% spelling. However, three learners scored 90%, denoting it the highest mark in this section, out of which 13% grammar, 17% vocabulary, and 60% for correct spelling in ESL for Learner B (15), while Learner XII (17) obtained 20% grammar, 20% vocabulary, and 50% spelling and Learner Q (20) scored 15% grammar, 15 vocabulary, 60% spelling. On the other hand, only one learner scored 70%, out of which 10% in grammar, 10% in vocabulary, and 50% in spelling (Learner Z (20)), and one learner scored 50%, out of which 10% grammar, 10% vocabulary and 30% spelling (Learner S; 17). Lastly, the lower marks in impromptu writing are 18%, 20%, and 40%. These are learners who are said to have struggled to produce a comprehensive story, that lacked cohesion, was poorly punctuated, and lack of contextual norms. Such learners are Learner 0(16) who scored 40%, out of which 10% for grammar, 10% for vocabulary, and 20% for correctly spelled words in their writing, Learner P (17) who scored 20%, of which 5% grammar, 6% vocabulary, and 9% spelling, and Learner Y with 18% in impromptu writing, 3% denoting grammar, 5% vocabulary and 10% correctly spelled words in their writing. All in all, these results show that deaf ESL girls can write when presented with multimedia learning that arouses their interest in practicing their writing skills in ESL. Those that scored lower are those older deaf ESL girls, which may be believed to be both mentally retarded and deaf. Despite being retarded and only deaf, all deaf girls appear to master spelling in writing, vocabulary coming the second place, and ESL grammar the last place.

4.3.1.2.1.2.2 Deaf Boys' post-test scores

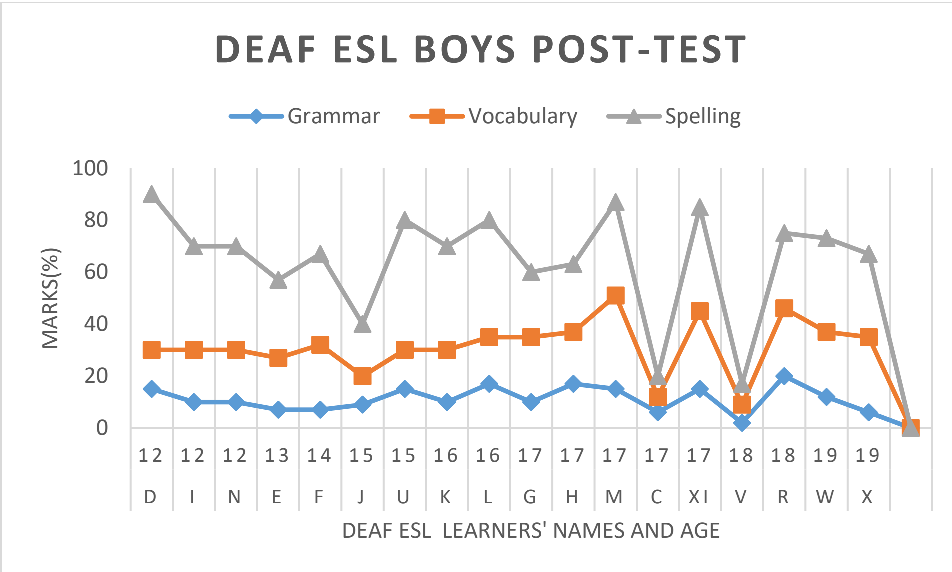

Figure 14. Subset 6 Post-Test Results for Deaf ESL Boys

Unlike it is for deaf ESL girls, there appears to be not a big gap between the marks attained for correctly spelled words and vocabulary for deaf ESL boys. Although spelling still ranks at 60% as the highest, vocabulary ranks at 36% as the highest in impromptu writing. This may mean that deaf ESL spelling development is in concurrence with their vocabulary development. This is why the graph above denotes that out 87% that Learner M (17) scored, 15% denotes grammar, 36% vocabulary, and 36% spelling. Learner XI (17) also scored closer vocabulary and spelling marks out of 85% he scored, of which 15% for grammar, 30% for vocabulary, and 40% for spelling. Following these with no huge difference between the vocabulary scores and spelling scores are Learner X (19) with an overall score of 67%, out of which 6% grammar, 29% vocabulary, and 32% spelling, Learner R (18) with an overall score of 75%, of which 20% grammar, 26% vocabulary, 29% in spelling and Learner W (19) who obtained 73%, out of which 12% grammar, 25% vocabulary, and 36% spelling. Although Learner V (18) obtained lower marks in impromptu writing with an average score of 17%, the development of vocabulary and spelling are in coherence with 2% in grammar, 7% in vocabulary, and 8% in spelling. Learner C (17) with a 20% overall score, scored 6% in grammar, 6% in vocabulary, and 8% in spelling, while Learner H (17) scored 63%, 17% in grammar, 20% in vocabulary and 26% spelling and Learner G (17) with an overall score of 60% scored 10% grammar, 25% vocabulary and 25% spelling. Despite this, there is only one deaf ESL boy who obtained the highest mark in impromptu writing at 90%, however, with huge differences between vocabulary and spelling scores with 15% grammar, 15% vocabulary, and 60% spelling (Learner D;12). Those that scored 80% come second places, such as Learner U (15) with 15% grammar, 15% vocabulary, and 50% spelling, and Learner L (16) with 17% grammar, 18% vocabulary, and 45% spelling. Further, only two deaf ESL boys of similar ages scored 70% with similar results in grammar (10%), vocabulary (20%), and spelling (40) (Learner I and Learner N). These learners were followed by Learner F (14) who scored 67%, 7% in grammar, 25% in vocabulary, and 35% in spelling, Learner E (13) scored 57%, 7% in grammar, 20% in vocabulary, and 30% spelling. Lastly, Learner J (15) scored 40%, 9% grammar, 11% vocabulary and 20% spelling.

In summary, Table 11 below shows a summary of means, standard deviation, and median for the three developed skills in writing. The scores for both deaf ESL girls and boys imply that all deaf learners have visual memory denoting the ability to remember how words are spelled with mean values (boys; 34.83, girls; 36.66, total= 71.49). The majority of deaf appear to have grasped ESL vocabulary from pictures hence coming second to spelling with mean value (boys;24.17, girls; 12.51, total= 36.68). This implies deaf ESL girls appear to have scored higher marks in vocabulary than boys. The deaf learners who scored lower in vocabulary signify significant delay in vocabulary development, while all deaf learners scored lower marks in grammar, making it the least developed skill in writing with mean values (boys;8.67, girls;8.5, total= 17.17).

	Boys			Girls		
	Mean	Median	Standard deviation	Mean	Median	Standard deviation
Grammar	8.67	8.5	4.29	8.5	10	5.18
Vocabulary	24.17	23	8.19	12.51	13.5	7.9
Spelling	34.83	23	9.71	36.66	30	13.54

Table 11. Measures of Central Tendency and Dispersion of Grammar, Vocabulary & Spelling

Given that these are results from subsets 1 through 5 and subset 6 of Hammil & Larsen's Test of Written Language, there is a need to provide a summary of deaf ESL learners' scores to help in understanding the effectiveness of the TCA on deaf ESL learners' writing skills: grammar, vocabulary and spelling abilities. Therefore, measures of central tendency and variability were used. They were chosen for their "no temporality issue" (Crad Coach, 2022). Since the outcome is measured after intervention, I was certain that it occurred after it. Therefore, the below table presents the overall means (average value of a set of data), standard deviation helped measure the dispersion of a set of data points from the mean. Lastly, the median represents the middle value in the dataset and is useful when there are outliers in data that could skew the mean.

Pre-test			**Post-test**		
	Girls	*Boys*		*Girls*	*Boys*
Mean	21.7	17.11	Mean	57.67	67.67
Median	22	14	Median	62	68
Standard deviation	16.58	12.71	Standard deviation	23.72	16.27

Table 12. Measures of Central Tendency and Dispersion of Deaf ESL Learners' Scores

Table 12 above demonstrates the pre-test and post-intervention scores for all learners. It is worth noting that since there were 12 girls and 18 boys, their means, median, and standard deviation are not to be compared, however only their pre- and post-intervention measures will be compared. Therefore, this table shows that in the pre-test overall mean scores (17.11) for boys were lower than their post-intervention means (67.67). Similarly, that of girls appears to have increased post-intervention, from 21.7 to 57.67 accordingly. This improvement in post-intervention shows that there was writing skills improvement for most deaf ESL learners. Additionally, the median value for boys was 14 in pre-test, and post-test 68, while those for girls increased from 22 to 62. This difference in median values shows that there were changes in deaf ESL learners' writing skills level in terms of their grammar usage, vocabulary, and writing correctly ESL words. Lastly, the standard deviation for boys in the pre-test was 12.71 compared to the post-test which was 16.27, and for deaf ESL girls was 16.58 which increased to 23.72 in post-intervention. Thus, by calculating this before and after intervention, I assessed how the scores deviate from the average hence providing insights into the consistency of improvement of writing skills among deaf ESL learners.

4.3.1.2.2 Structured observation

In this section addressing the third research question, descriptive systems were employed to evaluate the effectiveness of TCA on the development of deaf ESL learners' writing skills (grammar, vocabulary, and spelling). As my role may have influenced deaf ESL learners' behaviour, a reflective peer coach (Vidmar, 2006) was used to encourage reflection and self-awareness before, during, and after teaching. The reflective peer coach was a deaf ESL teacher, who was well versed in deaf culture. In essence, the structured participatory observation checklist was conducted by me, the researcher, but with the help of a deaf ESL teacher for thorough assessment. Given that the current study employed two circles of action research, there were two structured observations, one per circle. It is worth noting that, since in the diagnostic phase, the structured observations were used to diagnose the communication modalities to employ in TCA, it appears reasonable to conduct structured observation to evaluate the effectiveness of those strategies in improving deaf ESL learners' writing skills.

No.	Criteria	Frequency counts			Duration measurement		
		Never	Sometimes	Always	Short	Moderate	Long
1	**Visual cues**			✓ ✓			✓ ✓
	-Are visual cues used effectively during communication?						
	-Are sign language and gestures clear and easy to understand?			✓ ✓			✓ ✓
	-Do visual cues support understanding of written language?			✓ ✓			✓ ✓
2	**Engagement**			✓ ✓			✓ ✓
	-Is there active engagement between the teacher and deaf ESL learners?						
	-Are there opportunities for deaf ESL learners to ask questions or seek clarification?		✓	✓			✓ ✓

	-Is feedback provided constructively?		✓ ✓	· ·		✓ ✓
3	Use of technology		✓ ✓	· ·		✓ ✓
	-Are technological tools integrated into communication?					
	-Are online resources used to enhance writing?		✓ ✓	· ·		✓ ✓
	-How is technology leveraged to bridge the communication gap?		✓ ✓	· ·		✓ ✓
4	Writing activities		✓ ✓	· ·		✓ ✓
	-Are writing activities tailored to deaf ESL learners' needs and preferences?					
	-Are writing skills reinforced through practical application?	✓	✓	· ·	✓	✓
	- Are writing tasks accessible and appealing for deaf ESL learners?			· ·		
5	Collaboration		✓ ✓	·		✓ ✓
	-Are learning strategies shared and coordinated to ensure a holistic approach?					
	- Is there engagement between the teacher, the deaf ESL learners, and the writing content?		✓ ✓	· ·		✓ ✓
	--Is there engagement and interest among deaf ESL learners?		✓ ✓	· ·		✓ ✓
6	Environment		✓ ✓	· ·		✓ ✓
	- Is the learning environment conducive to effective communication and writing development?					
	- Are distractions minimised to facilitate focused learning?		✓ ✓	· ·		✓ ✓
	- Does physical space support the use of various communication modalities/	✓	✓	· ·		✓ ✓

Table 13. Structured Participatory Observation Checklist

As shown in Table 13 above, the researcher demonstrated all the items on the checklist in employing TCA, specifically the items rated *"always"* and *"long"* such as visual cues, engagement, use of technology, and collaboration. However, there appear to be setbacks in writing activities and the environment. These are related to the researcher's inconsistent inability to reinforce the writing skills through practical tasks, sometimes providing no opportunities for deaf ESL learners to ask questions. The last item *"environment"* showed that sometimes the physical space did not support the use of various communication modalities at moderate times. Assumably, this could be a sample of mentally retarded deaf ESL learners who unlike other deaf ESL learners are mostly destructive with shorter attention spans and hence found the writing tasks not appealing to them even though various modes were employed to help develop their writing skills.

4.4 Conclusion

This chapter presented data analysis and presentation. Given that the current study was Embedded Mixed-Method research within a PAR, data was thus presented based on phases of PAR using an embedded design of data collection. The next chapter discusses findings and results.

CHAPTER FIVE

DISCUSSION OF FINDINGS AND RESULTS

5.0 Introduction

This section of the mixed method research discusses the findings and results. The findings and results are discussed per action research phase, and research question.

5.1Diagnostic phase

This phase of action research is addressed by two qualitative research questions. It was mainly on identifying the current writing skills of grade 7 deaf ESL learners and identifying the communication modalities to employ in TCA to develop the identified level of deaf ESL learners' writing. In this diagnostic phase, the research findings and results are discussed per research tool employed to generate data as per qualitative and quantitative phases in embedded design.

5.1.1 First research question: What are deaf ESL learners' current level of writing skills?

5.1.1.1 Qualitative phase

5.1.1.1.1 Document Analysis

In document analysis, the findings are discussed per theme that arose in data analysis to address the research question. The themes are graphic features, grammar, discourse, and context.

5.1.1.1.1.1 Graphic features

Most deaf ESL learners have difficulty spelling new words (Olson & Caramaza, 2010), even though some of them are proficient in the nuances of ESL graphic elements. This may be due to their inability to access spoken language, therefore tend not to pay attention to the signing of unfamiliar words. Their inability to write words and sentences with proper organisation appears to be impacted by their apparent deficiencies in understanding how language functions (Deaf Children Australia, 2012; McCloskey & Rapp, 2017). As it happens, the only terms they correctly write in ESL are those that they encounter every day or that their teachers use regularly, such as school, eat, girl, or boy.

Furthermore, the native language of deaf ESL learners is visual. This suggests that not much attention is paid to the proper use of punctuation marks in signing, even though punctuation, syntax, and tone are conveyed through body language and facial emotions paired with signs in sign language. This could account for their work's poor punctuation. Nevertheless, regardless of individual variances, it requires a caring and compassionate teacher to make sure that every ESL learner learns punctuation, which is an essential skill for writing in English. According to the Indeed Editorial Team (2023), a well-written piece is presented well, using bold and parallelism to enhance readability and clarity.

Due to their limited linguistic history, deaf ESL learners are likely to become overwhelmed by ESL assignments, particularly those that require them to write. As a result, they frequently have terrible handwriting, irregular word spacing, and no modifiers before nouns and verbs as evident above. Given their orthographic deficits—the inability to translate the abstract representation of letters to the physical/motor movements required for writing—deaf people have weak handwriting (McCloskey & Rapp, 2017). As a result of this lexical-semantic language competency and grammar, it is therefore expected that they produce sentences with a variety of incorrect grammar and spelling uses (Bowers et al., 2015).

5.1.1.1.1.2 Grammar

The deaf ESL construct sentences that lack coherence despite the difficulties with graphic characteristics, as seen in the table above. Since it demonstrates that they write sentences that resemble the syntax of their home language, this may be caused by the grammatical discrepancies between sign language, which is their native language, and English. Their lower-density writing (Bowers et al., 2016) is the root cause of this ongoing struggle and may lead to errors or inconsistent sentence structures. The grammatical norms, sentence structures, word groups, and sentence patterns of the two languages are all impacted by these distinctions.

"Me Mosotho" is correct and conveys a clear message in sign language grammar, but ESL grammar follows a strict "subject, verb, object" order, which makes this not the case. This suggests that more words are needed to convert the sentence to ESL grammar, like in the case of "I am a Mosotho girl." They are purportedly the result of or the source of sentences having more lexical variations, content elaboration, and grammatical errors (Le et al., 2020). It could be argued that deaf ESL learners demonstrate in their writing that they may be lacking some knowledge of the fundamentals of language (Deaf Children Australia, 2012).

5.1.1.1.1.3 Discourse

Nonetheless, deaf ESL learners excel in text organisation and content, as seen by their ability to accurately write assignment titles and class work tasks. Specifically, these deaf learners are adept at replicating headings and titles that their teacher writes for them on the board because they would rather write about what they see or know (American Speech-Language-Hearing-Association, 2013; JCIH, 2019, White, 2018) than use their creativity. Furthermore, precise numbering and bulleting are used to bolster the text and give their written work significance.

5.1.1.1.1.4 Context

Conjunctions appear to be difficult for the deaf to understand, which is consistent with the previously stated assertion. This is in agreement with the claim made by Malik & Naseer au Din (2019) that all deaf ESL learners have difficulty using conjunctions because their home language only enables them to form shorter, simpler sentences and their language is visual-spatial. As a result, they frequently misuse complex grammatical constructions like conjunctions (Pooresmaeil et al.: 2019). Nevertheless, this just serves to reinforce the idea that deaf learners only get conjunctions they are familiar with correct and get unfamiliar ones such as "yet, so" wrong. This demonstrates that deaf ESL learners have poor vocabulary of unfamiliar words.

5.1.1.2 Quantitative phase

As a reminder, two data generation tools yielded results for this particular phase. TOWL and structured participatory observation.

5.1.1.2.1 Hammil and Larsen's Test of Written Language Pre-test

5.1.1.2.1.1 Subset 1 through 5 and Subset 6

The deaf ESL learners' struggles with ESL grammar and vocabulary (Nicolarakis, 2020) may be shown by their poorer scores, which could be related to their insufficient spoken language (Hall et al. 2019). Agreeably, even the methods used to teach deaf ESL learners how to write in the language may have caused this and limited their access to the accessible language that they require to succeed in their learning.

Furthermore, it appears that deaf ESL learners' neuro-linguistic structures—particularly those about grammar formation and second language acquisition—have been impacted by their challenges with grammar (Marks, 2020), especially for learners who scored lower and are older than 18. These lower scores also suggest that these deaf ESL learners may have been exposed to sign language after 5 years. Therefore, the Institute (2011) states that certain deaf learners are known to have a fund of knowledge impairments, which Hall et al. (2017) state are brought about by a cumulative deficiency in environmental information. As a result, these learners are likely to have difficulties learning a second language.

An ESL learner must become an expert sentence writer if they hope to receive higher grades. As a result, the deaf may have received lower marks on writing assignments because they used a lot of incorrect content words in their sentences despite using fewer words overall. In particular, deaf ESL learners who are 13 years of age and older are predicted to write such sentences and receive lower scores since their vocabulary density has an impact on their ability to produce written work (Gardenfors, 2023). Writing in ESL is, in fact, more challenging for deaf ESL learners, as seen by the overall performance of all deaf learners, regardless of age or gender.

Given that Gonzalez et al. (2022) explain that a lack of phonological awareness makes it difficult for them to recognise and retain orthographic forms of words, it is possible that the assignments that particularly required them to compose their own sentences and paragraphs contributed to their consistently lower test scores. This incapacity could also indicate a limited vocabulary and inadequate comprehension of English syntax and semantics among the deaf. As a result, interventions that support the development of deaf ESL learners' syntax and semantics should be implemented, paying special attention to the many complex gender factors (Al-Saadi, 2020).

Nevertheless, deaf ESL girls seem to perform better than males on the tests. This is due to the belief that women possess an advantage in terms of writing skills. Larger vocabulary, more intricate syntax, fluency, editing prowess, and better writing quality are examples of this (Al-Saadi, 2020). On the other hand, boys are expected to compose sentences with a range of improper spelling and grammatical usage, which is linked to lexical-semantic language competency and grammar. As a result, it appears that boys performed poorer on tests than girls.

In conclusion, all deaf ESL learners have low overall scores, which indicates that they have difficulties grasping ESL grammar, have limited vocabulary, struggle with spelling, and generally struggle with punctuation while writing in ESL. This represents their writing proficiency, which will help to successfully influence the integration of TCA to address the difficulties they encounter when writing in ESL. Due to the complex relationship between deaf ESL writers and ESL grammar, an inclusive approach that skillfully addresses their particular communication challenges is required.

5.1.2 Second research question: What communication modalities to employ in TCA to develop deaf ESL learners' writing skills?

To address this question, the three data generation tools were employed to get thorough understanding of the modalities to employ. That is, all the participants in the study offered their insights. That is, deaf ESL learners were interviewed in FGDs, the ESL teachers were interviewed in in-depth interviews, and the researcher herself as the participant observed the ESL teacher's teaching.

5.1.2.1 Qualitative phase

5.1.2.1.1 FGDs

During data analysis, the following themes emerged and the discussion is per theme: Language development, communication preferences, cultural considerations, educational history, and communication challenges.

5.1.2.1.1.1 Language development

Deaf ESL learners' lexical and grammatical choices show that language development should be taken into consideration in designing instructional strategies, specifically looking at their use of content words, smaller-size vocabulary adapting linguistic rules, and exhibiting syntactic complexity. All these may be attributed to limited exposure to language development. For this reason, Kuntzee et al. (2016) claim that language development delays are not a result of deafness but rather are a direct result of their social environment, which does not completely support language usage. This is consistent with Marks' (2020) finding that language delays seem to affect the neuro-linguistic processes in the brains of deaf learners that are connected to the establishment of grammar and second language acquisition. As a result, it frequently depicts the adaptation of second language linguistic norms, such as *"English difficult,"* which would have been *"English is difficult"* according to exact English grammar. This means that, if these deaf ESL learners were not deprived of spoken language, they would pick up these structures faster.

As can be seen from the aforementioned responses, deaf ESL learners are at risk for long-term effects on their language and cognitive development due to a lack of accessible language instruction. Hence, it is demonstrated that they respond to questions with familiar vocabulary such as *"no," "teacher,"* and *"love."* Their difficulties with the subtleties of spoken English could be the reason for this. Mayer (2009) elucidates that by using a combination of visual aids, such as movies with written transcription, deaf learners can access knowledge through multiple modalities to improve their learning and retention.

5.1.2.1.1.2 Communication preferences

However, the lexical and grammatical choices that deaf ESL learners incorporated into their communication strategies revealed a stronger preference for infographics when combined with sign language. These options include using succinct, simple phrases such as "videos me love," "*English difficult,"* and *"challenges nothing"* when answering inquiries. It makes sense to believe that they resemble the native grammar of deaf ESL learners in some way. They frequently use iconic representations, non-standard word ordering, and signed idioms in their communication (Scott & Dostal, 2019). It turns out that all deaf pedagogical strategies should recognise the importance of sign language as a basis for cognitive growth when promoting spoken ESL.

5.1.2.1.1.3 Cultural considerations

Cultural considerations should also be taken into account when teaching deaf ESL language and communication backgrounds. The lexical and grammatical choices made by the deaf ESL learners in the above table include their use of particular terminology that has cultural importance and their direct grammar-translation from sign language while answering questions. "Me don't know" and *"videos me love"* are examples of direct sign language grammar, which follows the *"object, subject, verb"* word order. Thus, it can be concluded that the usage of these grammatical features by deaf ESL learners indicates that deaf learners have difficulties learning language outside of their culture (Higgins & Lieberman, 2016). To effectively instruct and communicate with deaf ESL learners, it is imperative that individuals recognise the significance of their culture and its expressions by utilising several communication modalities.

5.1.2.1.1.4 Educational History

Despite this, it seems that the educational background of deaf ESL learners is also important when determining which modalities to use in TCA. According to Dostal & Lederberg, 2021; Hutchison, 2007; Tellings, 1995, the educational background serves as a guide for the intervention design that aims to accommodate all deaf learners from the oralist or manualist era. As can be seen in Table 4.5, these learners' lexical and grammatical choices differ; for example, oralist learners use simplified vocabulary *"don't know", "no"*, whereas manualist learners use abstract wording (challenges). As a result, it seems reasonable that the integration of modalities for these learners should be different, while also attempting to create a more supportive and democratic learning environment (Henner et al., 2016). These strategies involve using technology to create inclusive learning settings that support learners in learning ESL by encouraging even more appropriate use of facial expressions and helping them progress from using shorter phrases to using them.

5.1.2.1.1.5 Communication challenges

In addition, assistive technologies are required to lower barriers to ESL learning through captioning, thereby promoting participation and enabling deaf ESL learners to engage in meaningful conversations. This is consistent with the above table, which illustrates the communication challenges faced by deaf ESL learners, as reported by Martins et al. (2015), including difficulties with abstract word usage and syntactic differences. These learners are considered to face communication challenges due to their dual status as deaf and ESL learners (Howerton-Fox & Falk, 2019), which makes it difficult for them to understand abstract concepts or linguistic nuances and, as a result, difficult to decode complex structures.

5.1.2.1.2 In-depth interviews

Teachers' ability to use charts to involve learners in the learning process was highlighted as being very helpful for teaching ESL sentence structures. Using a chart as a visual aid enabled them to employ speech and/or sign language to guide their instruction. It is claimed that visual aids enhance student learning (Luckner & Handley, 2019). This is in line with the teachers' claim that they are aware of the fact that their tendency to generate words slowly aids with word formation and pair cooperation.

As a result, the efficacy of the circle method or roleplay, as demonstrated by the teaching tactics the ESL teacher employs to teach writing, is determined by the previously indicated teacher skill. One could argue that teachers would not know how to use role-play or the circle method if they were insecure or lacked experience with charts and grouping. Nonetheless, failure to integrate could occur if those tactics did not specifically highlight the utilisation of several modalities. To ensure that all learners have equal access to information and may engage fully in class activities, using diverse modalities in second language learning fosters inclusive classrooms (Baker-Smomoe et al., 2014).

Deaf ESL learners can express themselves fully when there are no hurdles to communication, such as when they struggle to sign an exact ESL and lack the necessary signing skills (Freeman et al., 2014). Working in pairs, these deaf learners' exposure to various environmental circumstances appears to have formed these communication hurdles. In this instance, the contextual elements improved student-teacher engagement through pair work, charts, and probing. According to Johnson & Johnson (2009), teachers should incorporate more interactive or group activities into their lessons to help learners develop their social and collaborative abilities. According to Light & McNaughton (2014), simultaneous group work on class assignments through probing may cause deaf ESL learners' fragrant language intake, which would impede their ability to improve literacy, particularly in areas like vocabulary building and higher-level skills.

Considering that contextual elements like repetition and charts may have affected deaf ESL learners' engagement and participation, it stands to reason that they would be more interested in writing on board as opposed to on their books. The teachers claimed that this aids in their deaf ESL learners' comprehension of the distinctions between the syntax used in sign language and ESL. Their interest in the material was consistently piqued by writing on the board, in contrast to their daily exercise books. The development of writing skills in English as a second language requires a strong foundation in one's native language, according to Atar et al. (2021), even though the focus on several modalities may cause one to lose sight of mastering any one skill. When given clear guidance, charts and the use of repetition in this instance promote conversation and dialogue among deaf English as a second language learners.

The teachers' responses about their teaching tactics, however, indicated that they necessitate a thorough comprehension of contextual elements. That is to say, for their deaf ESL learners to benefit from the chart and circle approach, they must comprehend how to apply the repetition method and how learners collaborate in groups. Through the use of multimedia in second language learning, deaf ESL learners were able to interact with language-rich environments, maximise their abilities, lessen their disabilities, and improve communication with other deaf learners (Maria-De Leon, 2010). It might be argued that these ESL teachers' choice of modality may not properly meet the special needs of deaf learners, more specifically if teachers themselves lack an understanding and experience of the subject they teach. For instance, such is seen exposing deaf ESL learners to spelling problems in writing and a lack of vocabulary. These are such modalities that prevent deaf ESL learners from remembering things.

5.1.2.2 Quantitative phase

5.1.2.2.1 Structured observations

This section discusses results from structured observation. Since there were pre-determined criteria to observe, the discussion is per each item that was observed.

5.1.2.2.1.1 Visual cues

It was found that a deaf ESL teacher *"occasionally"* used visual clues when instructing deaf ESL learners in writing. This could imply that she believed standard teaching methods could benefit deaf learners and that they could learn to write in the same way as hearing-impaired learners. The results align with Sign Solutions (2021), which states that it is presumed that deaf learners pick up writing skills in the same way as their peers. Furthermore, it was noted that the teacher's gesticulations and sign language were ambiguous. A solid foundation in sign language as a mother tongue might offer visible and approachable language models to improve general language development, so this may impede the learning of ESL (Andrew et al., 2014; Cummins, 2000).

Furthermore, the teacher's *"uneven"* application of visual signals hindered learners' ability to comprehend written language. The requirements and preferences of deaf ESL learners in learning a second language would have been satisfied if visual cues had been included in the instruction. Some deaf ESL learners may find that visual-spatial methods like graphics and signs are helpful, while others may be content with lipreading and sign language on their own. According to Gallaudet University (2021), deaf learners respond differently to the teaching methods and resources employed in their learning. Specifically, visual elements that support cognitive processing are beneficial to all deaf learners, according to research by Pisoni et al. (2014).

5.1.2.2.1.2 Engagement

The findings demonstrated that there was *"never"* any communication between the teacher and the deaf ESL learners. This problem, in my opinion, is the result of improper teaching strategies.

Nonetheless, teaching strategies such as fingerspelling might have made deaf ESL learners more interested in their learning. Bunta et al. (2016) found that all deaf learners stay engaged in meaningful language activities and gain a greater knowledge of second language content when visual teaching aids such as fingerspelling are used.

Deaf ESL learners were *"never"* given the chance to raise questions, nevertheless. It seems that inappropriate teaching methods are the main cause of deaf ESL learners' inability to fully utilize their abilities and freedom of expression. Nonetheless, TCA might have aided deaf ESL learners in becoming expressive by including printed words, sign language interpretation, fingerspelling, and gestures (Masood et al., 2024). Thus, as they learn, they can express and recall their cultural identity through the recognition of new terminology and the numerous communication channels. That is, there would have been active interaction between the deaf ESL learners and their teacher if different communication modalities had been used. Kauffman & Marentette (2013) showed that TCA enhances deaf people's social and emotional development.

5.1.2.2.1.3 Use of technology

It was noted that the instruction of writing did not incorporate any technology tools. Technology is thought of as a teaching tool that encourages interest in the learning process in all learners. Humphries et al. (2022) have also found that access to language-rich contexts, digital tools, and proper assistance are crucial for successful ESL acquisition and mastery.

Furthermore, the technology resources were *"never"* utilized to close the communication gap. This contradicts the findings of Cannon & Guardino (2013), who found that integrating instructional strategies such as technology is essential for offering invaluable information, encouraging communication, and meeting the needs of each individual learner. Deaf ESL learners can interact with the material through technological integration. This is in line with Article 3 of the 2019 Conventions on the Rights of Persons with Disabilities, which states that all learners with disabilities have the right to full inclusion and participation in society.

5.1.2.2.1.4 Writing activities

In the teaching and learning of writing, the writing tasks were *"never"* tailored to deaf ESL learners' needs and preferences. Agreeably, their unique communication needs were also not taken into account as they are described by Higgins & Lierberman (2016) as specially, linguistically, and socially different groups of people.

The failure of writing for them may have resulted from the lack of educational resources since their differences were not taken into account. Deaf learners are more inclined to actively absorb the information being taught when they are given access to various multimedia representations that meet their needs and encourage them to participate in their education. Blumberg et al. (2019) further emphasise—according to CTML—that knowledge is more effectively absorbed when presented in multimodal formats. According to resources, multimedia enables deaf ESL learners who are disadvantaged and have difficulty with abstract notions of writing in ESL to access information through many channels. This is in line with Greer & Mayer's (2013) assertion that multimedia channels are active cognitive processes that improve people's learning.

Furthermore, it was discovered that the writing tasks were not supported by practical application. Presumably, deaf ESL learners are likely to write in odd ways, implying that they write numerous words and sentences per T-unit, which suggests grammatical complexity. According to a 2019 study by Pooresmail et al., deaf learners frequently misuse grammatical constructions such as conjunctions. That is, since writing is even more difficult than reading and speaking for the deaf due to higher cognitive demands placed on their writing tasks, Arfe et al. (2022) state that they will likely face even more challenges in learning a second language if writing tasks are not accessible to them. These appear to have the potential to hinder learners from improving their writing skills while they are learning. According to Maton & Howard (2018), all learners have difficulty writing if they do not perceive the value or practical use of those abilities in their day-to-day activities.

There needs to be clear instruction on lesson activities because deaf ESL learners are among the learners who have short attention spans. The ESL teacher was seen *"never"* and *"sometimes"* as not providing clear instructions on grammar rules and sentence structures. Consequently, this could mean that even though she used finger spelling to get learners involved in the learning process, some learners are probably still behind since they were exposed to information they were unfamiliar with. According to the National Deaf Children's Society (2009, 2018), lip reading and clear signage are essential for simple navigation. This suggests that deaf ESL learners could have understood ESL grammar and sentence structures if lip-reading and fingerspelling were used in instruction.

5.1.2.2.1.5 Collaboration

It was not observed how deaf ESL learners interacted with their teacher or the writing material. The absence of visual aids during the learning process led to the discovery of this lack of collaboration. The fact that deaf learners learn best visually may account for this (Alaward & Musyoka, 2018). Therefore, for deaf learners and the content being taught to interact effectively, the teaching resources should coincide so that the content can be accessed by them. TCA would have allowed deaf students to interact with the material in a free and independent manner. According to Adi et al. (2019), TCA, a visual tactile method, enhanced the overall ESL literacy of deaf learners because it lets teachers and learners apply creativity to make learning engaging and easy.

Additionally, the teaching strategies were *"sometimes"* shared and coordinated to ensure a holistic approach. The teacher's use of collaborative tasks such as peer tutoring while teaching writing ensured this, whereby more experienced deaf ESL learners assisted the novice. These teaching methods are considered engaging and culturally relevant since they promote multimodal communication among learners and, in turn, enhance teacher-learner collaboration. According to Peterson et al. (2009) and Harzer et al. (2017), the claims align with the PE FIT theory, which promotes the creation of learning environments that take into account individuals' needs and values.

5.1.2.2.1.6 Environment

The use of meaningful and pertinent language in a culturally enhanced learning environment helps deaf learners become more proficient communicators and writers, according to Ukessays (2018). Meaning that recognising and observing the cultural factors that deaf people face is a sign of effective teaching and learning. Thus, one must respect and take into account their cultural characteristics while deciding which teaching modalities to employ with them. However, that was not the case as it was discovered that the teacher *"never"* made the classroom environment conducive to effective communication, as a result limiting deaf ESL learners' ability to maneuver classroom resources accordingly. Hrastinski & Wilbur (2016) contend that all deaf are capable of achieving high levels of linguistic and academic proficiency when provided with language-rich environments and educational support.

According to Purwowibowo & Hartono (2018), LCT theory acknowledges that language varieties can coexist and even strengthen one another. This approach facilitates the development of a thorough awareness of social experiences for deaf ESL learners by utilising many linguistic modalities. This was not the case, either, since the deaf ESL teacher was seen using sign language erratically, combining signs, and utilising both precise English language syntax and sign language grammar at the same time. It further denotes that the classroom distractions were *"never"* minimised to facilitate focused learning. It seems logical to conclude that confusion and disinterest in the material covered in class resulted from it. Without a doubt, technology-based ESL learning can create interactive learning and minimize distractions (Australian Disability Clearinghouse on Education and Training, 2020). In a nutshell, the use of visual aids may have reduced distractions by providing clear and concise information that is easily accessible to all (McTee et al., 2019).

Agreeably, the ideas above influence how writing abilities and content are taught and are linked to a stronger emphasis on the learning process. Nonetheless, even with an interactive learning process, there was little chance that the deaf ESL learners' cognitive level would be met by the books available in the classroom, making the learning environment unfit for the successful development of their writing skills. It appears from this that the deaf ESL learners were under cognitive strain due to their degrees of abstraction, generality, and complexity. This is referred to as semantic density by Maton (2010), drawing on LCT. Despite this, peer interaction was seen to exchange ideas and provide writing feedback. According to the National Education Evaluation and Development Unit (2018), deaf learners are encouraged to collaborate to complete assignments and share knowledge in these learning environments.

5.2 Transformative phase

In this phase of action research, I implemented TCA and administered a post-test to determine the effectiveness of TCA on deaf ESL learners' writing skills. Thus, to determine its effectiveness, I used post-test scores and structured observation. Therefore, the discussion of findings and results are per research question and each tool I employed to generate data.

5.2.1 Third research question: How does implementing TCA strategies improve deaf ESL learners' writing skills in ESL?

This question is discussed in accordance with the research tools used and the mixed method's embedded design's sequential presentation. This suggests that qualitative data (document analysis) be discussed first, and then quantitative data (post-test and structured observation).

5.2.1.1 Qualitative data

5.2.1.1.1 Document Analysis

5.2.1.1.1.1 Graphic features

Deaf ESL learners' graphics improved after they were using taught TCA strategies because using several communication modalities improves learning with repetition in different contexts. This is consistent with TCA proponents that value multimodal content delivery (Beal, 2015). For example, it was found that deaf ESL learners correctly spelled both known and sight words, including "*he", "it", "book", and "school"*. It appears possible that because they learned using a variety of senses—visual (viewing signs), kinesthetic (making signs), and auditory (lipreading speech and hearing sounds for some)—they retained the information better and spelled words correctly.

Additionally, it was shown that there was improved phonological awareness of the terms *"blowing"* and *"welcomed."* This demonstrated their writing's extensive vocabulary and sound manipulation skills, which allowed them to employ words that readers may not be familiar with. Given that Gonzalez et al. (2022) contend that phonological awareness is a cognitive requirement that may hinder the deaf from anticipating the order of sounds in words, it suggests that visual aids improved their phonological awareness of sounds. Therefore, it is evident that TCA reduces the cognitive load associated with hearing loss by using visual assistance. This is consistent with the CTML's stance that multimedia depictions should improve learners' engagement and cognitive processing of the material (Malik & Marwaha, 2021).

5.2.1.1.1.1.2 Grammar

TCA techniques improved the sentence patterns and grammar of deaf ESL learners. The deaf ESL learners demonstrated this by being able to piece together words to form intelligible statements ranging from *"the is wearing elephant glasses?"* to *"Is the elephant wearing glasses?"*. Gallaudet University (2019) states that this finding relates to grammar comprehension because TCA incorporates exact ESL and sign language. This comprehension aids in literacy, particularly in writing in ESL, since deaf ESL learners learn to create ESL sentences while still recognizing the subtleties of their languages. Consequently, it helps deaf ESL learners realize how concepts are expressed in the two languages.

Apart from this, sentence groupings are also enhanced, particularly the correct use of subject and predicate, and subject compliments *“I like your glasses.” “I read twelve books this summer.”* In my opinion, sign language in TCA helps them understand the concept of a subject and predicate through visual representation. The visual representations as stated by CTML help with memory and recall of what is learnt (Mayer and Trezek, 2018). TCA’s ability to reinforce communication through multiple channels helped deaf ESL learners to properly use adjectives, adverbs, and possessives centred around noun.

However, although they correctly write coherent sentences with possessives centred around the noun such as *“the first day of a new term was exciting”* and *“The grade 7 stood outside their classroom”* are considered short sentences, with presence of content words and few grammatical words. Breland et al. (2022) and Mayer & Trezek (2018) found that deaf learners write sentences with fewer words, indicating challenges in writing high lexical density pieces of writing.

5.2.1.1.1.3 Discourse

Research indicates that ESL learners who are deaf create well-organized essays with appropriate numbering and bulleting to bolster the content and context. As they are also found to employ conjunctions and figures of speech correctly, such as *"You look as wise as Solomon,"* this indicates better cohesiveness and coherence in the work of deaf ESL learners. For this reason, there appears to be academic progress after TCA. According to MED et al. (2017), TCA enhances the academic performance of deaf learners by assisting them in remembering what they have learned and maintaining interest in the continuing activities.

5.2.1.1.1.4 Context

Deaf ESL learners' work signifies the appropriate use of unfamiliar words to construct coherent sentences *"The big shark is blowing bubbles."*. Given the challenges they faced with writing words they were not familiar with, it would have been expected that they would not produce write ESL work with such unfamiliar words. This is because they are noted by Hall (2017) as having low intelligibility of speech in terms of confusing sounds and typical errors. However, given the grammatical structures of sign language and ESL, Hoffmeister et al. (2021) argue that deaf people have difficulty with transition, and cohesiveness which arises from different ways that concepts are related in sign language and ESL.

Deaf ESL students gained an understanding of word meanings and the proper way to employ them in sentences by being exposed to written, spoken, and signed language. This is linked to reduced cognitive demands, which strengthens the mental connection between words and their meaning. For deaf learners, visual clues in TCA offered contextual support to aid in their understanding of ESL concepts. This is semantic gravity in LCT. It explains the degree to which an idea is bound up with its particular setting or circumstance (Maton, 2016).

5.2.1.2 Quantitative data

5.2.1.2.1 Hammil and Larsen's TOWL Post-Test

In this transformative phase, since the writing skills to be developed are vocabulary, grammar, and spelling in the two subsets of Hammil & Larsen's Test of Written Language, the discussion is based on those as sections for this phase.

5.2.1.2.1.1 Vocabulary

In developing vocabulary in the two subsets of the test, vocabulary appears to come second to spelling in terms of marks compared to grammar. It can therefore be agreed that the pictures incorporated in TCA helped the majority of deaf learners grasp ESL vocabulary. In CTML, Clark & Mayer (2016) state that for deaf people to grasp vocabulary, multimedia resources such as pictures help demonstrate the ideas being taught. Pictures are said to be active cognitive processing for all learners. This is also in agreement with Kwak et al. (2016) findings that promoting cognitive processing should be the main focus of multimedia presentations.

It can be remembered that fingerspelling was incorporated as one of the TCA strategies to develop deaf ESL vocabulary skills in writing, therefore it can be agreed that higher marks in vocabulary denote the effectiveness of fingerspelling, especially for one deaf ESL boy who scored the highest marks in vocabulary than spelling as in the with other learners. Fingerspelling was found to have lowered the deaf learners' cognitive burden associated with ESL learning. De Leon (2020) stated that TCA strategies in second language learning lessen the unnecessary cognitive burden.

Although Malik & Din (2019) state that the deaf have restricted vocabulary, and poor understanding of ESL syntax and semantics, deaf ESL learners scored much better vocabulary scores than boys, meaning that they have an edge when it comes to writing tasks. Al-Saadi (2020) asserts that deaf females have an edge when it comes to writing abilities, such as larger vocabulary, more fluency, and participation in local and global editing.

All deaf learners may have benefited from lip-reading, and fingerspelling in conjunction with visual aids in their development of writing in ESL. Alaward & Musyoka (2018) explain that employing fingerspelling as a pedagogical strategy helps enrich deaf learners' vocabulary because it is a visual aid that all deaf use to decode and remember word symbols so they write (Crushkin, 1998; Haptonstall-Nykaza & Schick, 2007).

However, no deaf learner scored 100% in ESL vocabulary and there is a group of those learners who scored lower marks. This may be due to being introduced to language later, those from the oralist era. Howerton-Fox & Falk (2019) explain that being exposed to language later in stages of life affects one's vocabulary. On the other hand, their lower marks show that they may have had a significant delay in vocabulary. Agreeably, Domalgla-Zysk (2016) states that deaf score lower vocabulary marks denoting a significant delay in vocabulary development, as written ESL does not also essentially translate from sign language, therefore grammar and vocabulary are not explicitly taught (Gardenfors, 2023).

5.2.1.2.2 Grammar

The distinctive lexical patterns seen in all deaf ESL learners' written work highlight the significant influence that their native language has on the evolution and organization of written ESL, hence found grammar as the most poorly perfumed skill. This is because Gradenfors (2023) explains that sign language and ESL grammar differ, therefore deaf learners' syntactic complexity is especially connected to ESL grammar. All in all, ESL is less flexible in grammatical structures compared to sign language.

As earlier discovered, grammar is the least developed skill in writing for all deaf ESL learners, with scores ranging from 0% to 20%. This emanates from the fact that deaf learners are language impaired causing them to omit crucial grammatical components. As explained by Marks (2020), language delays/impairment have an impact on deaf peoples' brain's neuro-linguistic structures related to the formation of grammar and learning of second languages.

Additionally, the majority of deaf ESL learners scored lower in grammar because they may have had challenges making sense of the ESL grammatical structure. This resonates with Baynton's (1996) findings that deaf people have difficulties trying to translate directly between ESL and sign language in terms of grammatical structures. It is further clarified by Lane, Hoffmeister & Bahan (1996) that the difficulty in this situation is that ESL is a spoken language that depends on phonology, morphology, syntax, and semantics for communication, while sign language is a visual language that depends on signs and body language.

However, the lower marks were also discovered to have been caused by the writing tasks that frequently failed to capture the subtleties of their written expression, grammar, morphology, and syntax. This is because learning written language is usually associated with speaking and understanding spoken language, denoting a complicated connection between deaf ESL writers and ESL grammar. Malik & ud Din (2019) explain that deaf learners have historically had difficulty learning ESL grammar because of the poor quality of their input during language acquisition.

Due to the differences between written ESL syntax and sign language, it was discovered that deaf ESL learners' syntactic complexities are especially connected to ESL grammar. This is apparent in consistent improvement in post-intervention scores in grammar, ranging from 10% to 40% accordingly. This may be tracked to the incorporation of TCA modalities that enriched the learning environment for ESL learning. Karchmer & Sparks (2010) found similar results that deaf learners who received TCA achieved more literacy than those who received instruction in sign language. TCA established rich linguistic settings to promote the growth of learners' expressive and receptive second language writing skills (Gallaudet University, 2019).

5.2.1.2.3 Spelling

In the two subsets of the tests in post-intervention, it appears that there were higher scores for spelling than there were scores for other skills, ranging between 10% to 85%. However, no deaf ESL learners managed to correctly write the spelling of all words. It can be assumed that those are mistakes related to deletions, insertions and substitution of letters. This is in consonance with Olson & Caramaza (2010) assertion that deaf learners tend to make errors related to deletions, adjacent exchanges, insertions and substitution of letter shifts. On the one hand, it is worth noting that those higher spelling marks are older deaf ESL learners, both boys and girls. Mucutch (1996) explains that young deaf learners due to their limited capacity to recursively switch between writing processes, their lower-level function such as spelling becomes automated and long-term stored, freeing up space in working memory, hence making mistakes in spelling than older deaf learners.

Consistently, their lower marks in spelling mean that they may have produced shorter bursts and confused letter patterns. To clarify this, Van Waes et al. (2016) explain that younger deaf learners struggle with spelling because they may have produced short bursts in writing, which indicates their lack of automation in low-level functions in the brain, such as spelling, confusion in word choice or numerous pauses before and between letters.

Additionally, it was also discovered that all deaf ESL learners including those who are mentally retarded master writing spelling of ESL words denoting their ability to remember how words are spelled (visual memory). This implies that all deaf learners' brains can interpret what is seen although linked to lexical-semantic language competence. The difficulty in this situation led to the use of sublexical spelling methods, hence none of them scored 100%. Vizzie et al. (2023) explain the challenges the deaf are faced in spelling are typified by a weaker use of sublexical spelling methods such as misunderstandings in sound-to-letter correspondences due to auditory discrimination.

In summary, for all deaf ESL learners despite age and gender to have scored higher marks in spelling show that the pictures as visual tactile that were incorporated into their learning as well as in their impromptu writing (subset 6) helped with memory retention. Lee & Secore (2022) explain that using pictures in chaining aids the deaf in connecting words in pictures, leading to better writing vocabulary and spelling. Pictures not only help deaf learners write better but also make the classroom environment language-rich, thus overcoming structural obstacles to keep all deaf learners engaged in learning. this is in line with the PE-FIT proponent that all educational institutions should work and create environments that meet learners' learning needs (Peterson et al., 2009; Harzer et al., 2019).

5.2.1.2.2 Structured observation

As earlier stated, in structured observation, there were two checklists used, one for each circle to observe the implementation of TCA to develop deaf ESL learners' writing skills (vocabulary, grammar, and spelling) in ESL. From the two circles, it was discovered that TCA enhanced visual cues, engagement, technology use, and collaboration in the learning process. However, there were challenges with writing tasks and the environment. Therefore, this section discusses the findings based explicitly on each item on the checklist.

5.2.1.2.2.1 Visual cues

The visual cues were *"always"* effectively used during instruction for the *"long"* in developing deaf ESL learners' writing skills. These findings here are consistent with Marschark & Houser (2012) who also found that when visual cues and demonstrations are incorporated into TCA, they help improve not only deaf people's communication skills but also vocabulary and grammatical ideas in ESL. In this instance, the visual cues help deaf ESL learners who struggle with abstract concepts to access writing content, particularly one that necessitates a deeper grasp of words and phrases. This is consistent with the LCT proponent; semantic density that recognises the varying degrees of abstraction, generality, and complexity among knowledge kinds (Maton, 2014).

Despite this, the other item under visual cues was that sign language and gestures were clear and easy to understand for deaf ESL learners. The recognition of sign language in TCA instruction as a core basis helps with visual stimulation of second language learning, because deaf learners may have difficulty with language outside their own culture. Hence, NIH(2015) advocates for the promotion of bilingualism in spoken ESL to close the cultural difference gap. This helped foster inclusiveness and successful communication for deaf ESL learners to understand the intricacies that come with two languages (National Consortium of Interpreter Education Centres 2006).

In the learning process, it was also discovered that the visual cues assisted the deaf ESL learners in writing. Given that deaf ESL learners have a smaller vocabulary than their hearing peers, particularly in abstract concepts that are not represented visually, sign language as a visual cue for the deaf is also tightly linked to the deaf people's cultural heritage, customs, and values (Marks, 2020). This in turn assisted them to write in ESL. Lieberman and Brovosky (2020) add that the visual-spatial elements helped the deaf acquire distinctive lexical patterns in written language. In essence, if visual access were limited, it would become challenging for the deaf to fully engage in educational experience and develop their writing skills.

5.2.1.2.2.2 Engagement

Similar findings to visual cues are also found in engagement, where there are consistent scores in two observations, denoted by *"always"* and "*long"*. To be specific, various modes incorporated in the learning of writing for the deaf, enhanced the engagement between teachers and learners. It is said that deaf learners engage in meaningful language activities and get a better understanding of language concepts through visual teaching tools such as fingerspelling (Bunta et al., 2016). Therefore, it is apparent that the enhanced engagement between ESL deaf learners and their teacher was from visual teaching tools that took into account the different learning styles of deaf ESL learners. In LCT, Maton & Moore (2010) explain that it assists in the development of teaching strategies that take into account the various degrees of writing skills difficulties.

When deaf ESL learners are exposed to opportunities to ask questions and seek clarification, this signifies that there is positive engagement in their learning processes. This is the second item on engagement that was *"always"* used for the *"long"*. This implies that the integration of various communication modalities lowered deaf ESL learners' affective filters since it was discovered that they were able to ask and seek clarification in their learning. These findings are similar to Droun et al. (2016) study that demonstrated that TCA through storytelling improves deaf learners' expressive abilities and comprehension abilities.

The deaf ESL learners' ability to express themselves was also apparent through their teacher's capacity to provide feedback. It turns out that the feedback was easily provided through the use of multimedia representations such as technological incentives with captioning to arouse deaf ESL learners' interest in learning. In that way, deaf ESL learners' cognitive processing was enhanced. CTML proponents as stated by Pisoni et al. (2014) elucidate that effective learning is enhanced when visual elements are used to encourage active processing. Thus, multimedia representations lower the cognitive strain associated with forcing the deaf ESL learners to listen or pay attention only to sign language interpretation and processing what is being signed, making the learning experiences for them more accessible and engaging accordingly.

5.2.1.2.2.3 Technology Use

In the two observations of participatory action research in two circles, the technology use items were *"sometimes"* used for the long *"time"*. This implies that the technological incentives were incorporated in the learning process to aid the communication modalities in TCA. Therefore, it seems reasonable to assume that with all items scoring *"always"*, the digital technological tools promoted an engaging and inclusive learning environment. Similarly, a study by Sheperd & Alpert (2015) that used technological incentives discovered that those tools promoted active and engaged learning for deaf learners. Technological tools help engage deaf ESL learners in the practical application of writing. Pragmatism paradigm proponent emphasises practical implications of the integration of diverse perspectives (Maarouf, 2019). The diverse perspectives are said to be from use of multiple modalities aided by technological tools.

Consistently, Martins et al. (2015) also found that technological assistive devices and captioning established inclusive learning for deaf people. Thus, when technological tools are employed particularly in second language learning, Findlater et al. (2019) explain that they allow deaf learners to access ESL content in ways that meet their linguistic needs. This implies that the technological incentives used helped establish a fit environment for each deaf learner. According to PE-FIT, people, including deaf people alter their surroundings to blend in better (Harzer et al. (2017).

Further, it was also discovered that there was "always" use of online resources for *"long"* time to enhance writing. This was demonstrated in Appendix 12, where a YouTube video was used as a teaching aid to help deaf ESL learners write. The use of the video helped in leveraging the communication gap by providing captioning clearly and understandably (Australian Disability Clearinghouse on Education and Training, 2023) and promoting an interactive learning experience. In support, Bauman and Murray (2010) found that TCA as a visually oriented teaching tool, when technology is integrated to provide captioning or transcription services, TCA helps facilitate access and encourages good attitudes toward language diversity in the classroom. This aligns with CTML that multimedia resources should have transcripts, closed captions, and alternate formats, particularly for deaf ESL learners with different needs in accordance with accessibility guidelines.

5.2.1.2.2.4 Writing Activities

Unlike the other criteria above with consistent results in the two circles, there were setbacks in this criterion in the two circles. That is, it was shown that the writing activities in ESL were *"always"* tailored to deaf ESL learners' preferences and needs through the integration of various communication modalities for the *"long"*. TCA is said to have accommodated all their communication needs as an interactive teaching approach to language learning. Nunn et al. (2022) found that deaf people require an alternative approach to ESL learning that takes into account their unique communication preferences.

In support of the above, Higgings & Lieberman (2016) explain that deaf people are spiritually, linguistically, culturally, and socially different. Therefore, when writing tasks are provided through technology incentives, the majority of deaf ESL learners will access the written language in that multimedia learning platform. The technological incentives are active cognitive processing that Greer & Mayer (2013) explain that they enhance learning for individuals. De Leon (2020) explains that TCA was found as an accessible multimedia learning strategy that accommodate all deaf learners with various learning needs and communication preferences to optimise their talents, minimise their impairments, and facilitate communication.

However, the writing activities were observed *"sometimes"* not reinforced through practical application *"long"*. It seems that TCA incorporation requires some effort and time to use in regular practices as well as creating and locating materials. This is a teaching strategy that aims for individualisation, which may be time-consuming and not allow for the teacher to get to reinforce writing in practical application. Agreeably, Dubin (2023) found that given TCA's potential for extreme individualisation, there may be a lack of standardised best practices and inconsistent teaching strategies such as not allowing teachers to expose deaf learners to practical applications of writing in ESL. However, in LCT, Maton & Howard (2018) explain that people, including deaf learners, struggle with writing skills if they do not see the practical application in their daily lives. This aligns with the pragmatic lenses that emphasises the practical consequences of actions and beliefs. The focus is how TCA practically enhanced writing skills in real-world applications, such as being offered a chance to practice their writing in ESL.

Lastly, the writing tasks through the incorporation of TCA were also not accessible and appealing for deaf ESL learners. Although it exposes deaf people to opportunities to benefit from rich linguistic input across a variety of modalities for the development of their writing, Light & McNaughton (2014) clarify that using various communication modalities simultaneously leads to fragmented language intake, which might obstruct the development of literacy, especially those related to building vocabulary and higher-level skills.

5.2.1.2.2.5 Collaboration

When TCA was incorporated into the learning of writing, it was observed that the learning strategies were shared and coordinated to ensure a holistic approach by the teacher. Therefore, with the flexibility of TCA, deaf ESL learners were able to maneuver and choose the communication method that best suited their understanding and expression. Their ability to choose empowered them to convey their thoughts and share their ideas clearly with their peers that Gardenfors (2023) states that it serves as an organic pause for average deaf ESL learners and novice deaf ESL learners to evaluate their work. The enhanced collaboration through multiple modalities was also discovered by Anita et al. (2012) leading to improved comprehension and collaboration within group activities

In addition, it was also discovered that there was *"always"* an engagement between the teacher, deaf ESL learners for *"long"* time, and the writing content. By having access to a variety of communication methods, deaf ESL learners can interact more effectively with the writing content (Breland et al., 2022; Mayer & Trezek, 2018) with their peers who have different preferences and abilities in communication (Nunn et al., 2022) and their teachers. With reference to Bunta et al. (2016), TCA equips deaf learners with the ability to engage in discussions, share ideas, and contribute meaningfully to the content being taught. However, given this TCA's flexibility and comprehensiveness, young deaf ESL learners are more likely to transition between various modes while simultaneously developing writing skills (De Leon, 2020).

The last item showed that when TCA was implemented, there was *"always"* engagement and interest among deaf ESL learners for *"long"*. By incorporating multiple modes of communication, deaf learners develop the social skills essential for effective collaboration. Kauffman & Marentette (2013) claim that TCA enhances deaf learners' social skills and emotional development. This is shown through the development of a more supportive and inclusive learning environment, particularly for those deaf who have emotional and social difficulties in the classroom such as the sample of deaf and mentally retarded ESL learners. Hernwatti (2013) found that when deaf people are involved in their learning, they feel motivated to actively digest the material being taught and successfully apply what they have learned.

5.2.1.2.2.6 Environment

This criterion is one of those with inconsistent scores in the two observations. Firstly, it was observed that the environment was *"always"* conducive to effective communication and writing development for *"long"*. TCA allows the researcher to tailor teaching methods to meet the diverse needs of deaf ESL learners (Karchmer & Sparks, 2010). Through the integration of visual cues, technological incentives (Martins et al., 2015), and an interactive activity (Beth, 2019), teachers create or provide individualised support. Further, TCA appears to have exposed deaf ESL learners to rich linguistic environments. This exposure enhances their communication skills and overall literacy development (Marschark et al., 2016). This aligns with PE-FIT proponents that underscores the importance of creating a supportive environment that caters to individual's autonomy, privacy, personal identity, and socialisation.

Apart from this, there was *"always"* a minimisation of distractions for the *"long"* time to facilitate focused learning. Birinci & Saricoban (2021) state that visual aids reduce distractions by providing clear and concise relevant information to deaf learners. Salamy Children's Hospital of Boston (2018) stipulates that deaf learners may navigate their environment using visual language since the majority of them learn best visually (Musyoka, Gentry & Bartlett, 2016). That is, the incorporation of sign language with spoken language helped maintain focus by ensuring that information is presented in a way that is comprehensible to each deaf ESL learner. To emphasise, a study by Sheperd & Alpert (2015) discovered that captioning in technological tools helps deaf learners stay engaged and focused during writing tasks.

However, it was shown that the physical space *"sometimes"* did not support the use of various communication modalities at *"moderate"* time. In reference to Appendix 19, it is apparent that there was limited visual access for deaf learners. these are related to a classroom setting, seating arrangements, classroom layout, and lighting in the classroom impeded deaf ESL learners' ability to see the teacher, their peers, and other visual aids. As supported by Marschark et al. (2018), implementing TCA in a traditional setting with limited space is challenging as there might not be enough space for effective sign language use as De Leon (2020) explains that it is the core basis of TCA. The lack of space restricts both the teacher's ability to sign clearly and deaf ESL learners' capacity to communicate using sign language effectively. This in turn causes deaf ESL learners to struggle to write eloquently due to insufficient access to an essential mode of communication.

5.3 Conclusion

This chapter discussed the results and findings. It consists of data generated from document analysis, focus group discussion, in-depth interviews, structured observations, and pre-test and post-test and analysed using the Reading to Learn Assessing writing tool, ATLAS.ti software version 24, and descriptive statistics to address research questions using the literature on the study. The next chapter provides conclusions, recommendations, and reflections on the study.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

The preceding chapter was on discussion of findings and results. This chapter serves as the last chapter for the current study, outlining conclusions and recommendations. It also comprises implications for further research, limitations, reflection, and recommendations.

6.1 Conclusion

The current study used participatory action research and a mixed-method embedded research methodology to shed light on how effectively TCA works to improve the writing abilities of deaf ESL learners. Incorporating many communication modalities such as written communication, spoken language, visual aids, and sign language (Masood et al., 2024) made it possible to create a more inclusive learning environment that met the individual needs of every deaf ESL student. Giving deaf learners the freedom to express themselves through various media increased their sense of belonging and motivation to take part in tasks related to writing. Specifically, quantifiable data indicated that TCA helped deaf learners, regardless of age or gender, enhance their writing skills, in particular, spelling than other writing skills (vocabulary and grammar). This indicates that having access to information via a variety of channels contributed to their comprehension and recall of writing.

Consistently, PAR improved the collaboration and engagement between the researcher and the deaf ESL learners and teachers in the research. In addition to improving the learning process, this cooperation gave me access to immediate and ongoing feedback, which let me modify my TCA strategies in response to the demands of deaf ESL learners and my observations in real time. Furthermore, because deaf learners are visual learners, the study also emphasized the significance of integrating deaf ELS learners' cultural features into their learning experience through the use of visual aids and sign language, which is their native tongue. Their cognitive load and affective filters—which were a result of their limited availability to spoken language and second language acquisition—were lessened in this linguistically diverse setting. Due to the more realistic context that these cultural components provided for TCA education, writing tasks became more engaging, and understanding improved.

PE-FIT underscored the significance of matching instructional strategies to the unique requirements and environment of those who are deaf. In light of this, the study showed that writing task engagement and understanding increase when communication modes are customized to the specific communication demands of deaf ESL learners. CTML, on the other hand, focused on how multimedia resources improved the development of writing for the deaf by integrating visual, aural, and kinesthetic elements. Deaf ESL learners were especially engaged in the learning process when sign language was used in conjunction with written text and visual aids. As a result, they were able to write more effectively and accommodate different communication and learning styles. Last but not least, LCT shed light on how knowledge is created in an ESL classroom. It assisted in demonstrating how TCA promoted an inclusive atmosphere where all types of expression were respected in addition to legitimising diverse forms of knowledge.

In summary, the study gave precedence to the practical results over rigorous adherence to any particular theoretical approach, driven by the pragmatism paradigm. Because of its adaptability, I was able to modify my teaching tactics in response to feedback from deaf ESL students in real-time, making sure that TCA strategies catered to their requirements and addressed the difficulties that deaf ESL students encountered when learning a second language.

6.2 Recommendations

The study recommends that all parties involved in the research process actively participate, based on the aforementioned conclusions. This includes teachers who use TCA, parents who support their children's education at home, and learners themselves. Involving all parties involved in the process will guarantee that different viewpoints are taken into account when creating ESL lessons for deaf learners, especially when it comes to the use of different communication modalities. This will result in the development of more culturally appropriate and responsive learning environments that are tailored to the needs of specific deaf learners.

The study also suggests developing TCA-based literacy programs that are adapted to various skill levels. Mead (2020) notes that while researchers can tailor programs based on continuous participant feedback to determine which strategies are most beneficial for a specific group of deaf learners, a one-size-fits-all approach may not be effective for all learners. These initiatives might center on integrating technology into TCA to offer more tools for teachers and hard-of-hearing learners. This would enable adaptable classroom settings where deaf learners can hone their writing and general literacy abilities.

The study concludes with a recommendation that Lesotho, through its Ministry of Education and Training, demand the creation of pedagogical strategies and assessment tools that reflect TCA and assess writing and/or literacy skills across a variety of modalities. This is due to the possibility that deaf learners' writing abilities may not be adequately captured by conventional evaluations. That is, rather than relying exclusively on written text, educational techniques, and evaluation instruments should enable deaf students to exhibit their comprehension using a variety of media, including written communication, visual assistance, and sign language, their native language.

6.3 Implications for Future Research

The present study's findings and results imply that more research on TCA may provide more advantages for deaf learners in a variety of learning environments. This could be accomplished by comparative studies that look at various teaching strategies, such as phonics-based training, to make comparisons easier and investigate the efficacy of TCA on deaf ESL learners' writing abilities.

Furthermore, the study recommends performing longitudinal studies to enable researchers to monitor the development of deaf learners over an extended period, based on the findings and outcomes of the current study. This will make it easier to determine the long-term advantages and difficulties of TCA. It may also assist in determining how early TCA exposure affects scholastic achievement and social integration in the future.

As technology advances, a major focus for future research is to thoroughly examine how it might be integrated into TCA practices. Examining interactive platforms and technologies may provide new insights into how to improve the deaf population's general literacy levels while keeping the learning process engaging.

6.4 Limitations

Due to the nature of the research and the primary participants, the study's limitations were mostly associated with deaf culture. I occasionally found it difficult to fully understand deaf culture in terms of language use and how to interact with deaf learners in general. The learning experiences and interactions that deaf learners had using TCA techniques were also impacted by their cultural origins.

Given that the school was mainstream, another drawback was related to educational environment variability, or the variations in learning environments, which occasionally impacted how TCA was used and understood by all students. I faced a time and resource barrier when implementing PAR in a mixed method since I had to create printouts for every deaf learner regularly. In addition, as a sign language interpreter, I lacked the necessary knowledge to deal with mentally retarded deaf learners because meeting the diverse needs of such learners within a group of deaf ESL learners required careful planning to ensure that all voices are heard.

6.5 Reflection

As an ESL teacher and a Lesotho sign language translator, this study was a worthwhile and difficult experience for me. Looking back on my freshman year of college, the experience was emotionally and physically challenging (healthwise and financially). Nevertheless, during the data generation process in the second year, implementing PAR inside mixed approaches needed a substantial amount of time and resources. In an attempt to understand a mixed-method embedded design within the PAR framework, I had to travel for our incessant meetings with my supervisor. The interactive aspect of PAR, however, made it possible for me to continuously reflect on and modify my TCA teaching strategies in response to feedback from deaf ESL learners and their teachers, which helped me even make more sense of my research approach during the data production phase. I learned a great deal about the subtleties and complexities of deaf culture and ESL teaching from working closely with deaf learners for such a long time as a sign language interpreter.

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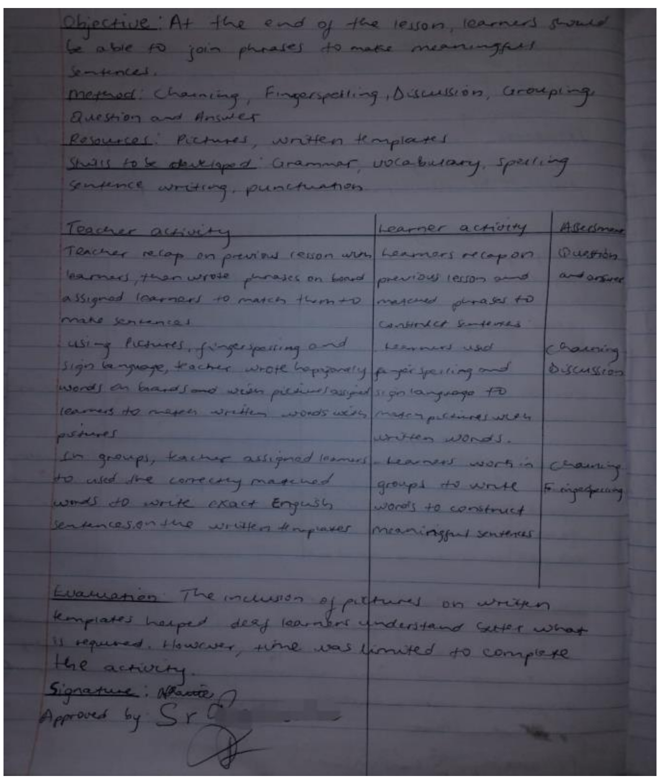
Appendices

Appendix one

Appendix two

Appendix three

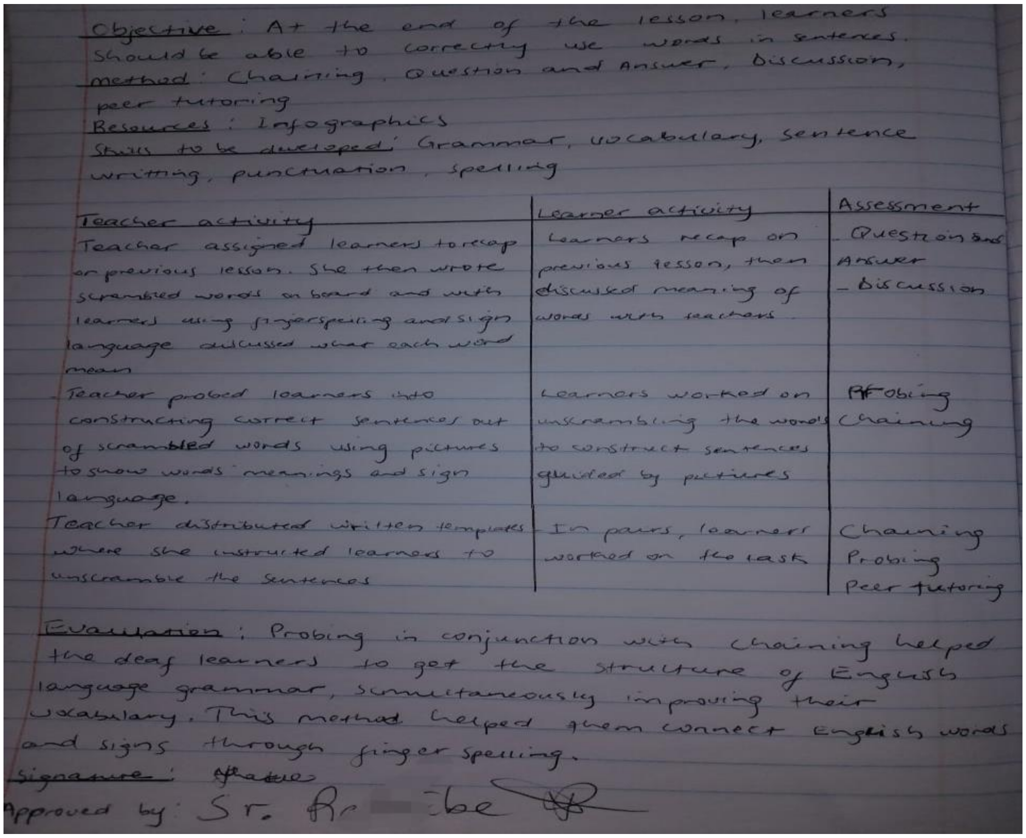


Objective: At the end of the lesson, learners should be able to join phrases to make meaningful sentences.
Method: Chaining, Fingerspelling, Discussion, Grouping, Question and Answer
Resources: Pictures, written templates
Skills to be developed: Grammar, vocabulary, spelling sentence writing, punctuation

Teacher activity	Learner activity	Assessment
Teacher recap on previous lesson with learners, then wrote phrases on board assigned learners to match them to make sentences	Learners recap on previous lesson and matched phrases to construct sentences	Question and answer
Using pictures, fingerspelling and sign language, teacher wrote haphazardly words on boards and with pictures assigned learners to match written words with pictures	Learners used fingerspelling and sign language to match pictures with written words.	Chaining Discussion
In groups, teacher assigned learners to used the correctly matched words to write exact English sentences on the written templates	Learners work in groups to write words to construct meaningful sentences	Chaining Fingerspelling

Evaluation: The inclusion of pictures on written templates helped deaf learners understand better what is required. However, time was limited to complete the activity.
Signature: Nkaote
Approved by Sr C [illegible]

Appendix four

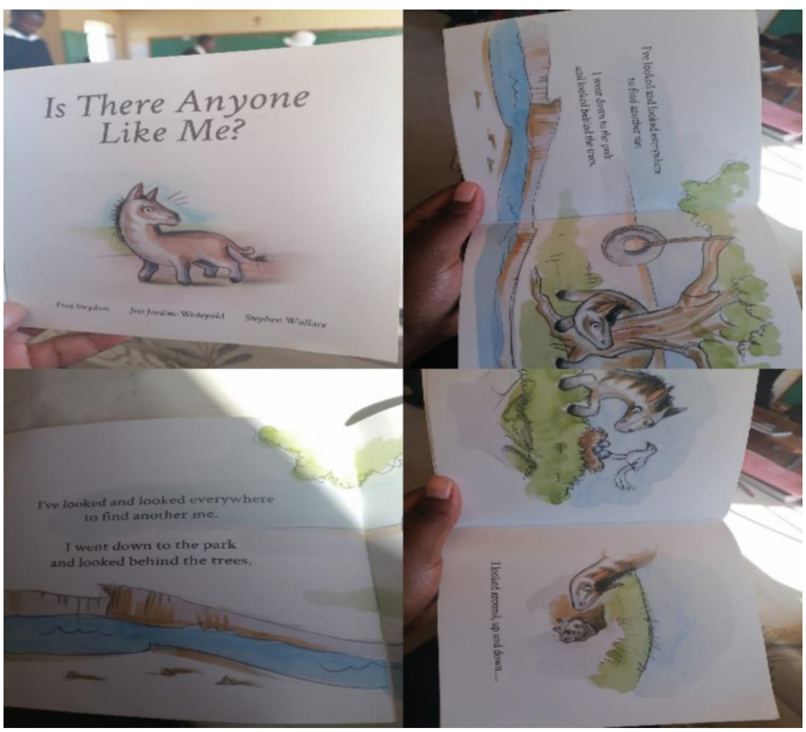


Objective: At the end of the lesson, learners should be able to correctly use words in sentences.
method: Chaining, Question and Answer, Discussion, peer tutoring
Resources: Infographics
Skills to be developed: Grammar, vocabulary, sentence writting, punctuation, spelling

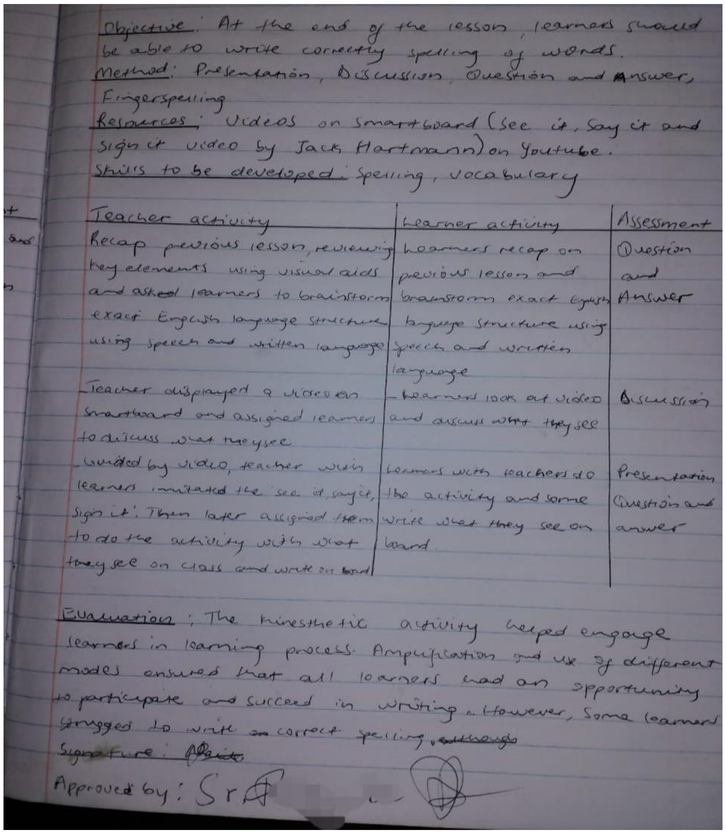
Teacher activity	Learner activity	Assessment
Teacher assigned learners to recap on previous lesson. She then wrote scrambled words on board and with learners using fingerspelling and sign language discussed what each word mean	Learners recap on previous lesson, then discussed meaning of words with teachers.	- Question and Answer - Discussion
- Teacher probed learners into constructing correct sentences out of scrambled words using pictures to show words meanings and sign language.	Learners worked on unscrambling the words to construct sentences guided by pictures	Probing Chaining
Teacher distributed written templates where she instructed learners to unscramble the sentences	- In pairs, learners worked on the task	Chaining Probing Peer tutoring

Evaluation: Probing in conjunction with chaining helped the deaf learners to get the structure of English language grammar, simultaneously improving their vocabulary. This method helped them connect English words and signs through finger spelling.
Signature:
Approved by: Sr. R[redacted]be

Appendix four



Appendix Six

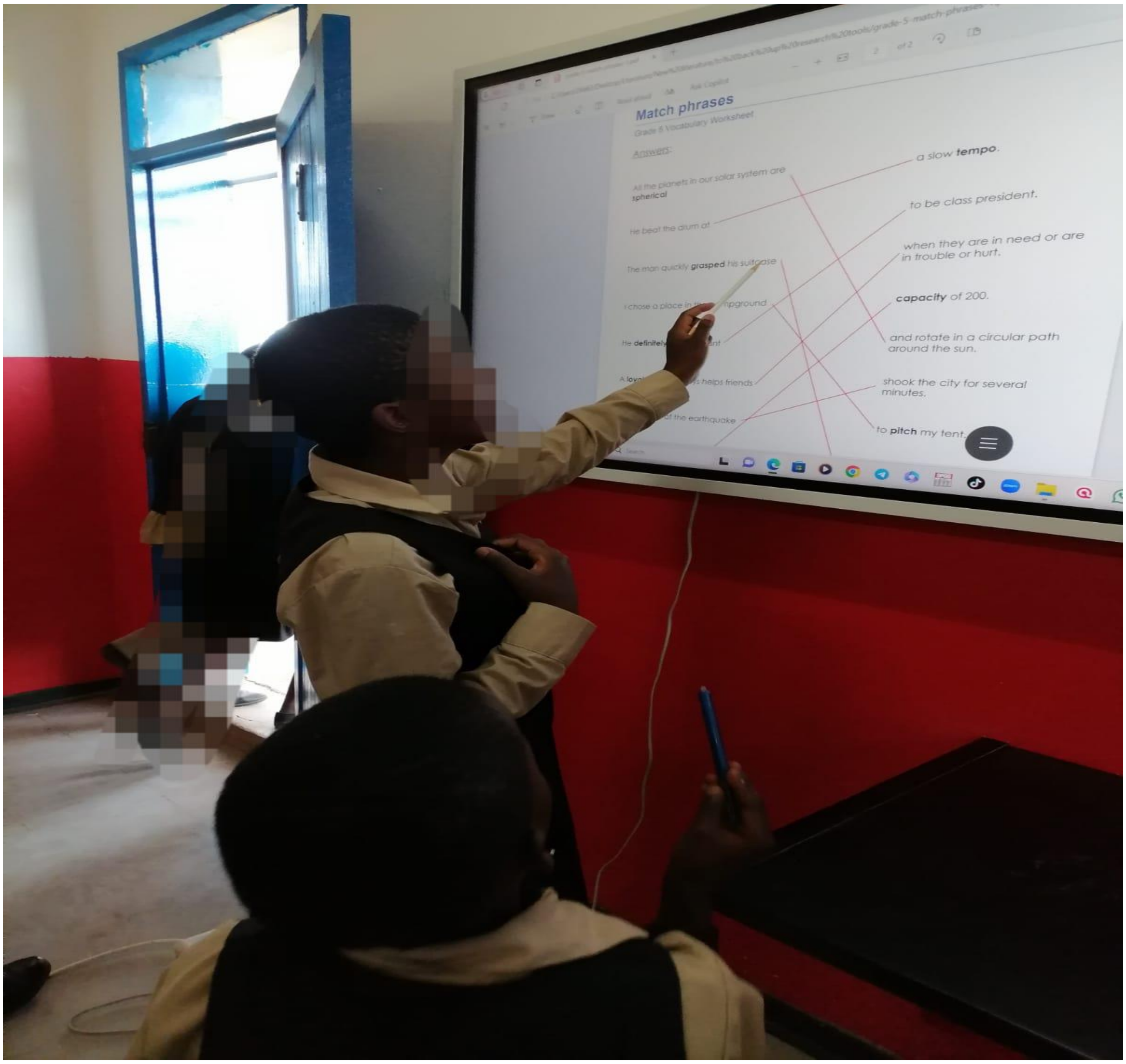


Objective: At the end of the lesson, learners should be able to write correctly spelling of words.
Method: Presentation, Discussion, Question and Answer, Fingerspelling
Resources: Videos on Smartboard (See it, Say it and sign it video by Jack Hartmann) on Youtube.
Skills to be developed: Spelling, vocabulary

Teacher activity	Learner activity	Assessment
Recap previous lesson, reviewing key elements using visual aids and asked learners to brainstorm exact English language structure using speech and written language	Learners recap on previous lesson and brainstorm exact English language structure using speech and written language	Question and Answer
Teacher displayed a video on Smartboard and assigned learners to discuss what they see	- Learners look at video and discuss what they see	Discussion
Guided by video, teacher with learners imitated the 'see it, say it, sign it'. Then later assigned them to do the activity with what they see on class and write on board	Learners with teachers do the activity and some write what they see on board.	Presentation Question and answer

Evaluation: The kinesthetic activity helped engage learners in learning process. Amplification and use of different modes ensured that all learners had an opportunity to participate and succeed in writing. However, some learners struggled to write ~~on~~ correct spelling, ~~although~~
~~Signature:~~
Approved by: Sr [redacted]

Appendix Seven



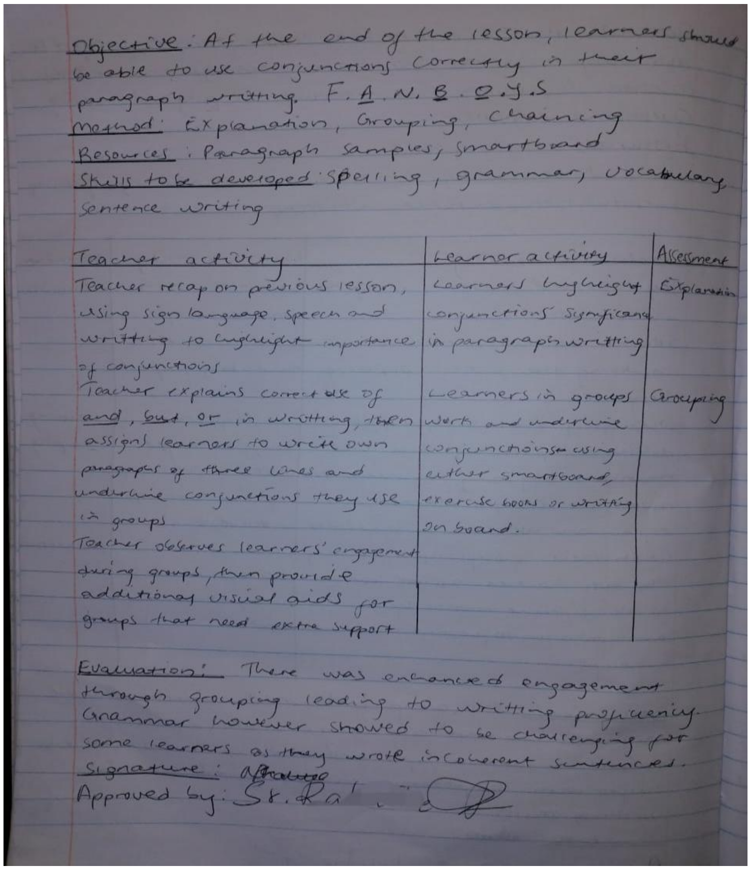
Appendix Eight

Objective: At the end of the lesson, learners should be able to join phrases to make meaningful sentences
Method: Discussion, Peer tutoring, Grouping, Chaining, Question and Answer.
Resources: Infographics
Skills to be developed: Grammar, vocabulary, Spelling punctuation, Sentence writting

Teacher activity	Learner activity	Assessment
Teacher and learners recap on previous lesson	Learners with teacher recap	Discussion
Teacher assigned learners to continue answering the previous writting template.	Learners work on writing template	
With group that struggled, she distributed pictures of verbs and nouns and using any communication mode, she assigns learners to explain and use them in sentences with their groups	A group that struggled to get work correct use different modes, explain words and use in sentence	Chaining Grouping
upon finishing the task, teacher assigns learners to use different modes of Communication to present their work in groups.	learners use different modes and present their work	Presentation

Evaluation: All groups of learners understood word meanings and were able to use them in sentences. Pictures in question paper and those of nouns and verbs helped with comprehension, hence improved sentence writting skills
Signature: [signature]
Approved by: Sr R

Appendix Nine

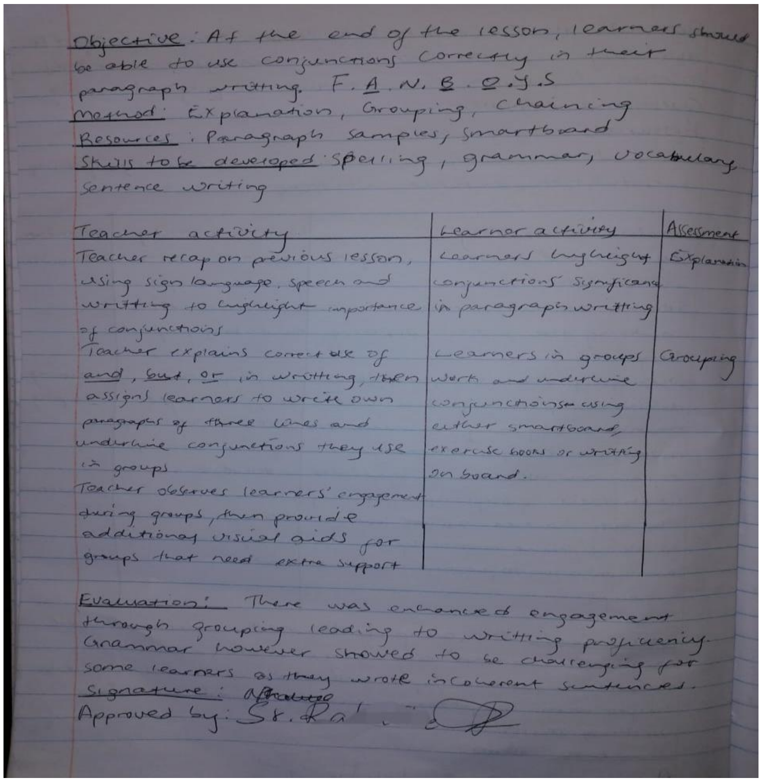


Objective: At the end of the lesson, learners should be able to use conjunctions correctly in their paragraph writting. F. A. N. B. O. Y. S
Method: Explanation, Grouping, Chaining
Resources: Paragraph samples, smartboard
Skills to be developed: Spelling, grammar, vocabulary, sentence writing

Teacher activity	Learnor activity	Assessment
Teacher recap on previous lesson, using sign language, speech and writting to highlight importance of conjunctions	Learners highlight conjunctions significance in paragraph writting	Explanation
Teacher explains correct use of and, but, or in writting, then assigns learners to write own paragraphs of three lines and underline conjunctions they use in groups	Learners in groups work and underline conjunctions using either smartboard, exercise books or writting on board.	Grouping
Teacher observes learners' engagement during groups, then provide additional visual aids for groups that need extra support		

Evaluation: There was enhanced engagement through grouping leading to writting proficiency. Grammar however showed to be challenging for some learners as they wrote incoherent sentences.
Signature:
Approved by: Sr. Ra

Appendix 10



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Teacher activity	Learnor activity	Assessment
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Teacher observes learners' engagement during groups, then provide additional visual aids for groups that need extra support		

Evaluation: There was enhanced engagement through grouping leading to writting proficiency. Grammar however showed to be challenging for some learners as they wrote incoherent sentences.
Signature:
Approved by: Sr. Ra

Appendix 11

Appendix Twelve

TEST OF WRITTEN LANGUAGE-Hammil and Larsen's (2021)

Subset 1 through 5

1.In the following sentences, select the correct word to complete each sentence:

Clear, skills, agree

a) Could you please ___________the table?

b) After lots of practice, her writing ___________ have improved.

c) we cannot ____________ with you at this point.

2. In the following sentences combine 2 nouns and a verb plus other word to make sentences.

Noun	Verbs	Nouns
Lerato	Chased	Story
The cat	Tells	The mouse

A)________________________________ .

B)________________________________ .

3) Circle the hidden words: store, far, fall, eat, heal

S t o r e e a t r a g b

O o h e a l a a p m e e

I b n r o f p o m g e j

F a l l h s e w f a p e

4) Punctuate the following sentences correctly:

a) yes I believe we will win

b) thabo lineo and thato were playing soccer, netball and basketball

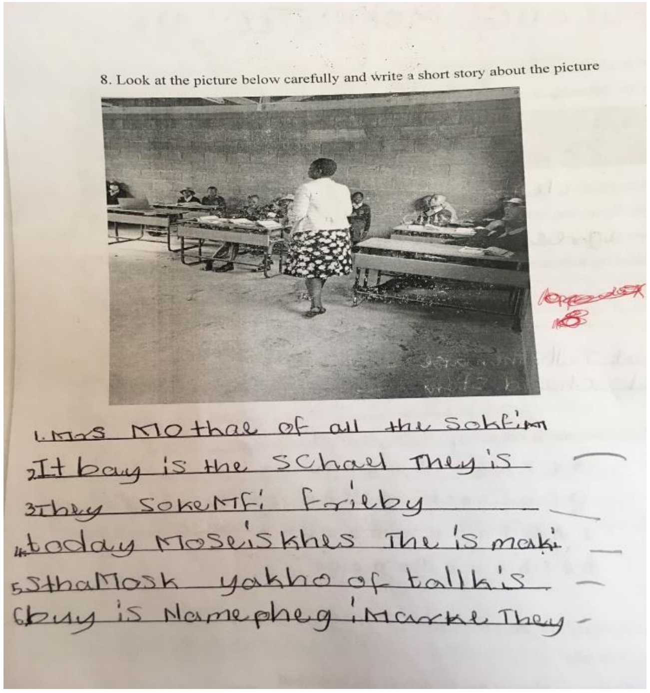
5. Write 3 sentences of your choice

6. Write a paragraph about the person you love most.

7. Correct all the errors in the following paragraph:

My name is Litaba Ntabe i live in farm near Senqu. I raises livetock and grow corn on my farm. My kid help me. In the morning, we up early to feet the animals. Everybody help milk the cows. Then I drive the kids to school. I work in the fields the day during. When the children come home, we all work together

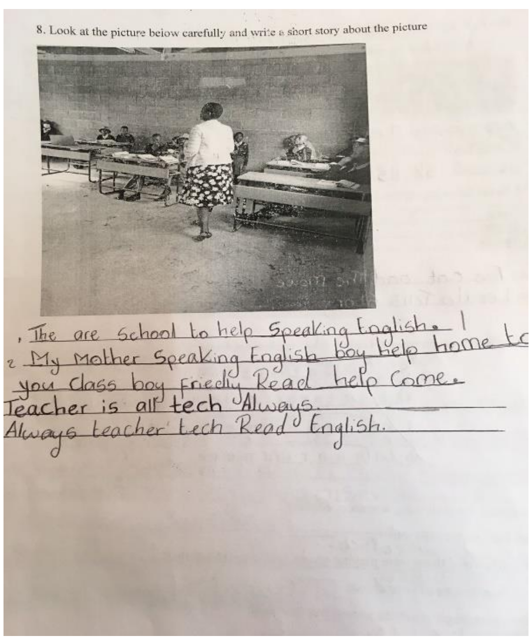
Appendix 12



8. Look at the picture below carefully and write a short story about the picture

1. Mrs MO thae of all the sokfim
2. It bay is the SChael They is
3. They SokeMFi Friebby
4. today Moseiskhes The is maki
5. SthaMosk yakho of tallkis
6. buy is Namephegi Marke They

Appendix 13



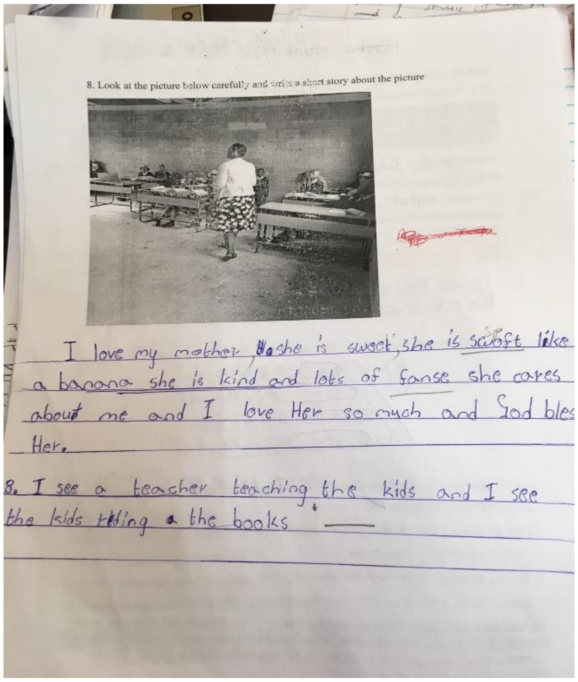
8. Look at the picture below carefully and write a short story about the picture

1. The are School to help Speaking English.
2. My Mother Speaking English boy help home to you Class boy friedly Read help Come.

Teacher is all tech Always.

Always teacher tech Read English.

Appendix 14

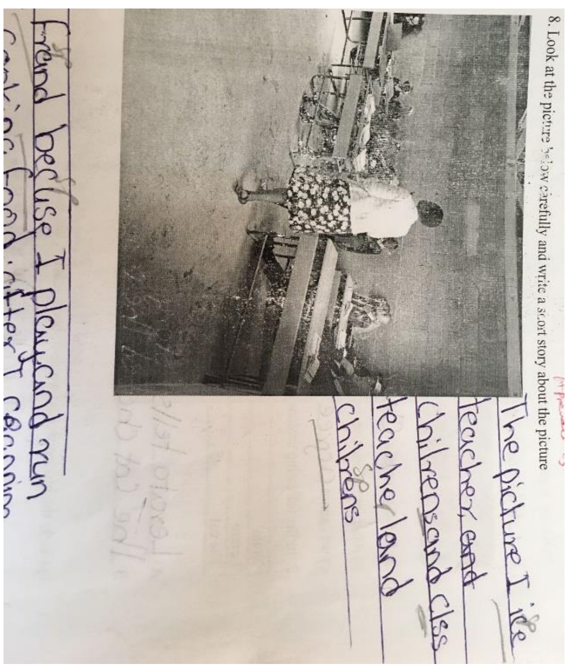


8. Look at the picture below carefully and write a short story about the picture

I love my mother, she is sweet, she is soft like a banana she is kind and lots of fanse she cares about me and I love Her so much and God bles Her.

8. I see a teacher teaching the kids and I see the kids riding a the books

Appendix 15

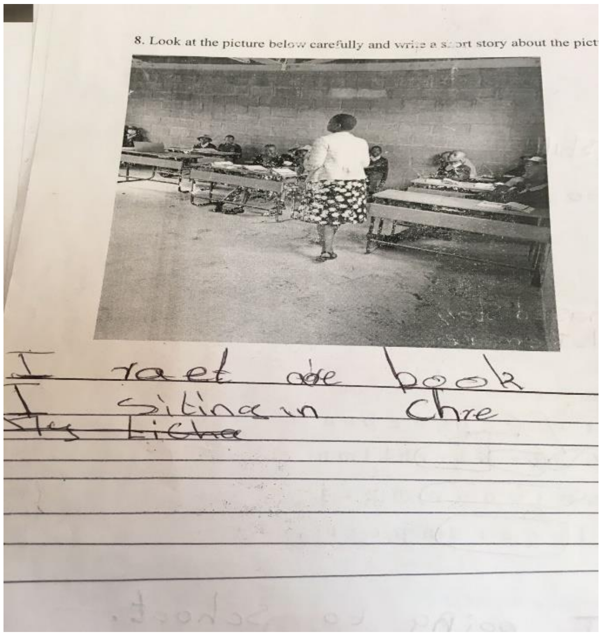


8. Look at the picture below carefully and write a short story about the picture

The picture I see teacher ~~and~~ chilrens and clss teacher and chilrens

Frend becuse I play and run

Appendix 16



Appendix 17-Focus Group Discussion

A) Language acquisition

- What primary mode of communication do you use at home?
- Are there any other languages spoken at home?
- How was language development supported during your early childhood?

B) Communication preferences

- Do you prefer sign language, speech, or a combination of the two?
- Are there specific communication tools or technologies that you find helpful?
- Did you receive any formal training in sign language or other communication methods?

C) Educational background

- What kind of school did you attend before you came here?
- What were your experiences like in school regarding communication with your teachers and peers?
- Were there challenges you faced in accessing educational materials or participating in a classroom?

D) Writing skills

- How comfortable are you with expressing yourself in writing?
- Do you enjoy writing stories, essays, or other forms of written expression?

E) Classroom experience

- How do you feel about your current writing tasks in class?
- Are there any specific challenges you face when writing in school?
- Were sign language interpreters provided in your class?

F) Support system

-Do you receive additional support for language and communication development outside school?

- Are there any specific strategies or tools that have been particularly helpful in improving your writing skills?

Appendix 18 In-depth Interviews

1. Can you describe your experience in teaching English as a second language to deaf learners, describing clearly the challenges you have encountered when it comes to developing their writing skills.
2. What are specific strategies do you use to address the challenges you mentioned above?
3. What key considerations or adjustments do you make in your teaching methods or materials to accommodate the different language proficiency/ language skills levels among your deaf learners?
4. How do you integrate visual and tactile supports such as Sign language, gestures, and other visual aids into your teaching to support the development of deaf learners' writing skills in your classroom?
5. Can you provide examples of successful experiences where you applied such strategies to enhance the writing skills of your deaf learners?

Appendix 19