

**UNIVERSITY OF EDUCATION, WINNEBA**

**VOICE NOTEBOOK AS AN ALTERNATIVE COMMUNICATION SUPPORT  
FOR DEAF STUDENTS AT THE ST. JOHN'S INTEGRATED SENIOR HIGH  
TECHNICAL SCHOOL, NAVRONGO**



**MASTER OF PHILOSOPHY**

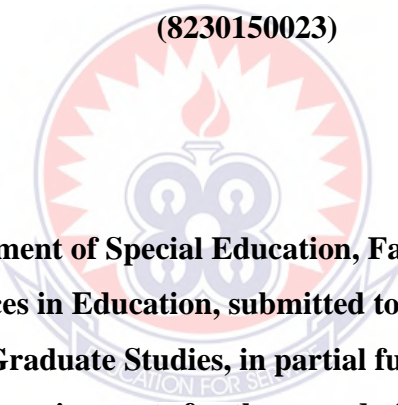
**2025**

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FOR DEAF STUDENTS AT THE ST. JOHNS INTEGRATED SENIOR HIGH  
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**ALFRED ADDI**

**(8230150023)**

The logo of the University of Education, Winneba, is a circular emblem. It features a central lamp with a flame, set against a background of a sunburst. The lamp is flanked by two stylized figures. The text 'UNIVERSITY OF EDUCATION, WINNEBA' is written around the top inner edge of the circle, and 'EDUCATION FOR ALL' is written around the bottom inner edge.

**A thesis in the Department of Special Education, Faculty of Applied Behavioural  
Sciences in Education, submitted to the school of  
Graduate Studies, in partial fulfilment  
of the requirements for the award of the degree of  
Master of Philosophy  
(Special Education)  
in the University of Education, Winneba**

**MARCH, 2025**

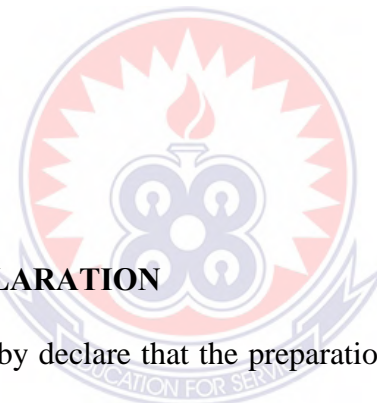
## DECLARATION

### Candidate's Declaration

I, **Alfred Addi**, declare that this thesis, except for quotations and references contained in published and unpublished works which have all been identified and duly acknowledged, is entirely my work, and it has not been submitted, either in part or whole, for another degree elsewhere.

**SIGNATURE:** .....

**DATE:** .....



### SUPERVISOR'S DECLARATION

I, **Dr. Daniel Fobi**, hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision the thesis as laid down by the University of Education, Winneba.

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## **DEDICATION**

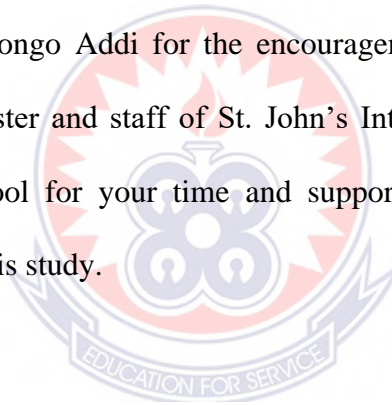
To Madam Bibiana Kapuri Addi, my lovely mother, for her support, and to my daughter, Lucina Weyirane Addi.



## ACKNOWLEDGEMENTS

I would like to express my profound gratitude to Dr. Daniel Fobi, my supervisor, for his invaluable guidance and support throughout my thesis. His expertise, dedication, coaching and patience are incomparable, I am grateful sir. I am also deeply indebted to Dr. Adam Awini for his insightful critiques and suggestions, which have significantly contributed to the quality of my research. His constructive feedback has been critical in helping me navigate the complexities of this study.

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## ABSTRACT

Deaf students in inclusive secondary schools continue to face communication barriers that limit classroom participation and academic performance, particularly where sign language support is inadequate. This quantitative study examined the effectiveness of Voice Notebook as an alternative communication support tool for deaf students at St. John's Integrated Senior High Technical School, Navrongo. An experimental research design was adopted, involving an experimental group and a control group. A total of 79 deaf students participated in the study. Data were collected using pre-test and post-test achievement tests in English and Social Studies, as well as a structured questionnaire measuring students' use and perceived effectiveness of Voice Notebook. Data were analysed using descriptive statistics (means and standard deviations) and inferential statistics (paired-sample t-tests and independent-sample t-tests). The findings revealed that Voice Notebook was most effective for note-taking ( $M = 3.6$ ) and recording reminders ( $M = 3.8$ ), but less effective for real-time conversations ( $M = 3.1$ ). Deaf students reported a high overall effectiveness rating ( $M = 4.4$ ,  $SD = 0.4$ ), indicating strong satisfaction with the tool. Academic performance significantly improved among students in the experimental group, with post-test gains ranging from 3.6 to 4.9 points across class levels ( $p < 0.05$ ), while improvements in the control group were minimal and statistically insignificant. The study concludes that Voice Notebook is an effective assistive technology that enhances communication access, classroom participation, and academic performance among deaf students. Based on these findings, the study recommends the integration of Voice Notebook into teaching and learning processes, alongside appropriate training and support mechanisms to enhance inclusive education for deaf learners.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the Study

Communication is the basis for human interaction. It connects us and allows us to exchange knowledge, share experiences and build deep connections. For all of us communication is not a tool, it is a core of shared experience and growth. For the deaf community, it is even more important (transcending language and sound). Deaf people have to navigate a world in which spoken language may be inaccessible to them, but they flourish as a result of rich visual communication. In many situations, particularly education, they use sign language interpreters to facilitate communication with hearing people.

Education, which is crucial to the advancement of society, has undergone great changes as a result of technology and an increased focus on addressing the needs of diverse learners (Trinidad & Ngo, 2019). Among these needs, the communication barriers experienced by deaf students deserve to be focused upon. They have difficulties comprehending spoken information and joining classroom discussions using the primary means of sign language interpretation (SLI) (Majoro, 2021). At St. John's Integrated Senior High Technical School, Navrongo, deaf students are faced with a major obstacle in their ability to communicate with non-sign language students, teachers and staff (Paatsch & Toe, 2020). The school has more than seventy-nine (79) deaf students in various departments and classes but only one SLI for each class (Edmondson & Howe, 2019). This situation brings out the necessity of a wider strategy and other supports for these students.

Effective sign language interpretation can take 20 to 30 minutes in each session. The issue with interpreters is a huge hurdle and the available resources are not sufficient to meet the communication needs of the deaf population in St. John's (Bai et al., 2020). When there are not enough interpreters, some deaf students are not given adequate support while they are in lessons, so their educational experience is poorer and they achieve less (Majoro, 2021).

Given this desperate need for new solutions, voice notebooks have been suggested as an alternative communicative aid (Simpson, 2022). Equipped with advanced speech-to-text technology, voice notebooks may help deaf students communicate well in the learning environment (Rizal et al., 2023).

Deaf students often face challenges in deaf classrooms due to the lack of communication support in a classroom that is predominantly spoken and the lack of access to interpreters (Dhanjal & Singh, 2019). There are various advantages to voice notebook technology. It can transcribe spoken instructions given by teachers in real time so that the student who is deaf can see the lesson content along with students who can hear (Rodriguez-Correa et al., 2023). It also allows for note-taking, the recording of reminders and reviewing material after class, which enhances comprehension and independent learning (Comino et al., 2024). Moreover, voice notebooks can be used as a back-up in case interpreters are not available, leading to a reduced reliance on limited human resources and information loss during lessons (Dokania & Chattaraj, 2024). Despite these promising advantages, there are few, if any, evidences that specifically document and describe the use of voice notebooks to facilitate communication in deaf schools in Ghanaian pre-tertiary institutions, thus justifying this study.

Artificial intelligence enabled voice notebooks can pick up the Ghanaian accent and swiftly translate the spoken English words to written English (Biktimirov & Gruzdev, 2022). Thus, the deaf students are able to access the interaction happening in the classroom through the captions on their devices (Samonte, 2019).

Additionally, the voice notebook is used to provide double value by acting as a backup in case the interpreters are not available (Samonte, 2019). In such situations, the device guarantees that the deaf students do not miss important educational materials (Trinidad & Ngo, 2019). This capacity is important given the scarcity of interpreters and the problems. Considering these factors, it was the purpose of this research to investigate the use of voice notebooks as an alternative communication aid for deaf students at St. John's Integrated Senior High/Technical School (SHTS) in the town of Navrongo.

## **1.2 Statement of Problem**

In education, inclusivity is among the guiding principles, which is the aspiration for a learning environment that values and responds to the diversity in the needs of all the students (Ainscow, 2020). St. John's Integrated Senior High/Technical School (SHTS), in the town of Navrongo, is one such ideal and is looking to create an academic environment where all students, whether they have hearing difficulties or not, can be successful (Narayan et al., 2024). At SHTS, the deaf students have sign language interpreters that help them share classrooms with their hearing peers (Caselli et al., 2020; Fobi, 2021).

Yet, for all that SHTS is committed to being inclusive, there is a great divide between intention and reality. For seventy-ninety (79) deaf students dispersed in different classrooms, simple communication is hampered by a limited number of

interpreters per class. Only nine interpreters serve all students and there is a mismatch between demand and supply. This shortage results in frequent communication failure which causes delays in the delivery of important information and also prevents full participation in academics, discussions and social life. The resulting isolation, lack of academic performance and overall reduced educational experience, limit their future options (Majoro, 2021). This gap has provided the impetus to investigate alternatives, primarily voice notebooks, that will help address the pressing needs of our deaf student body.

The lack of interpreters results in many barriers (James et al., 2022). It is motivated by the goals of academic achievement, and the deaf students are challenged by the environment that limits participation that allows them to flow comfortably (Kisanga, 2019). In classrooms, the limited interpretation becomes a problem that hinders the flow of ideas in the classroom. Discussions, projects, and even casual talk are difficult with important points being lost in translation (Musyoka & Smith, 2021). The difficulty of context rich and timely communication limits the holistic engagement, depriving students of all the education experiences (Paatsch and Toe, 2020).

St. John's SHTS has made efforts to make a dent in the communication gap by establishing a dedicated interpreter support system. However, ongoing difficulties testify to the difficulty of the task. Despite the efforts, the dependence on interpreters is not entirely effective in bridging the gap and hinders the full participation of deaf students in academic processes (Kisanga, 2019). The effects are not limited to the classroom and impact social interactions and collaboration as a result of the fractured communication (Starks & Reich, 2023). As part of the school's goal of becoming more inclusive, this challenge requires further consideration of alternative means of

communication, especially the integration of voice notebooks. The problem is the absence of empirically tested, affordable, context-specific strategies to improve the accessibility of communication to deaf students in the Ghanaian pre-tertiary schools. The policies around inclusive education focus on access and participation but there is a lack of evidence on the efficacy of mobile voice-to-text apps such as Voice Notebook in supporting classroom communication and engagement for deaf people. This study addresses this gap and discusses the use, effectiveness and impact of Voice Notebook as an alternative support tool for promoting inclusive practices which align with the institution's vision of equitable learning for all (Lehloa, 2019).

### **1.3 Purpose of the study**

The purpose of the study was to examine the use, perceived effectiveness, and impact of Voice Notebook as an alternative communication support tool for deaf students at St. John's Integrated Senior High/Technical School (SHTS), Navrongo. Specifically, the study sought to identify the ways in which Voice Notebook supports communication, assess deaf students' effectiveness ratings of its use, and examine its impact on their communication and academic performance within the Ghanaian pre-tertiary education context.

#### **1.4 Objectives of the Study**

The objectives of the study were to;

1. Identify the various ways in which Voice Notebook can be used to support the communication of deaf students and enhance their classroom participation.
2. Assess deaf students' perceived effectiveness of Voice Notebook as a communication support tool and its contribution to their learning and academic performance in the Ghanaian pre-tertiary education setting.
3. Examine the impact of Voice Notebook as an alternative communication tool on the academic performance of deaf students.

#### **1.5 Research Questions**

The following research questions were raised to guide the study

1. How can a voice notebook be used to support the communication of deaf students?
2. How do deaf students rate the effectiveness of voice notebooks as an alternative communication support tool for deaf students in the Ghanaian pre-tertiary context?
3. What is the impact of the voice notebook as an alternative communication tool on the academic performance of deaf students?

#### **1.6 Significance of the Study**

The study examines voice notebook technology as a communication support for deaf students, with the focus on their difficulties in class discussion and academic materials. The results help explain the value of voice notebooks in enhancing accessibility to communication and educational participation in the event that an interpreter is not available. If successful, the tool helps deaf students participate more

fully in their classroom and campus life, leading to a more inclusive environment as well as the solution to interpreter shortages.

The question of the user-friendliness of voice notebooks is also considered, looking at how well the interface is compatible with the intellectual and physical capabilities of deaf students. This evaluation is important to ensure that the technology is easy to use and accessible, so that the students can use it with confidence and independence. Positive findings give educators and designers ideas on how to improve teaching strategies and the design of technology to improve learning outcomes for deaf students.

The research also examines the greater social impact of voice notebooks outside the academic sphere and highlights issues deaf students may encounter. The results assist the schools to implement sustainable communication solutions and recommend to the software developers on how to enhance the software for a particular requirement among the deaf students. Finally, the research promotes a more equal and inclusive learning experience and policies and investments in available technology.

### **1.7 Delimitations of the Study**

This study was delimited to the use of voice notebooks as an alternative communication support for deaf students in the St. John's Integrated SHTS, Navrongo. The study was delimited to deaf students from preparatory class - SHS 3. The study included 42 males and 37 females pursuing regular education in the school.

## 1.8 Operational definition of terms

**Autonomy:** The ability of individuals to make independent decisions and take actions based on their preferences, beliefs, and goals.

**Communication Barriers:** Obstacles or challenges that hinder effective communication between individuals, often arising due to differences in language, culture, abilities, or other factors.

**Communication Support Tool:** A tool or technology designed to enhance communication for individuals with specific communication needs or challenges.

**Deaf Students:** Individuals who experience significant hearing loss, which may range from partial to complete hearing loss, and rely on various communication methods such as sign language or assistive technologies.

**Educational Efficacy:** The measure of how well educational practices, methods, or tools contribute to achieving desired learning outcomes and objectives.

**Empowerment:** The process of enabling individuals or groups to gain control, confidence, and autonomy over their lives and decision-making through increased access to resources, opportunities, and information.

**Inclusive Education:** An educational approach that aims to provide impartial access to quality education for all students, regardless of their background, abilities, or disabilities. Inclusive education fosters an environment where diverse learners are actively engaged and accommodated within mainstream educational settings.

**Innovation:** The introduction of novel ideas, methods, or technologies that bring about positive change, improvements, or enhancements to existing practices or systems.

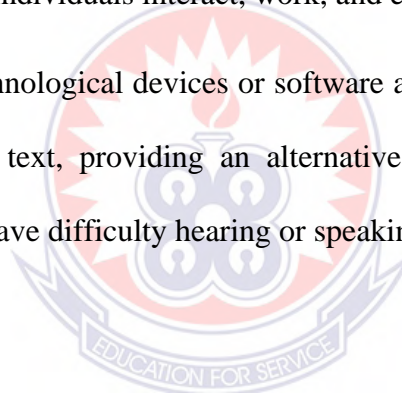
**Pedagogical Paradigm:** The underlying principles, theories, and approaches that guide teaching and learning practices within an educational system.

**Real-Time Interpretation:** The immediate conversion of spoken language into sign language or vice versa, allowing for smooth communication between individuals who use different modes of communication.

**Sign Language Interpreters:** Professionals trained to facilitate communication between deaf individuals who use sign language. Interpreters convey spoken language into sign language and vice versa.

**Socio-professional Landscape:** The broader social and professional context or environment in which individuals interact, work, and engage in various activities.

**Voice Notebook:** Technological devices or software applications that convert spoken language into written text, providing an alternative means of communication for individuals who may have difficulty hearing or speaking.



## CHAPTER TWO

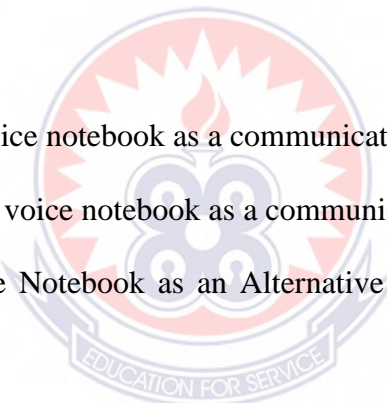
### LITERATURE REVIEW

#### 2.0 Introduction

This chapter presents a review of related literature on voice notebooks as an alternative communication support tool for deaf students. The literature reviewed also included research articles, journals, and books. The literature reviewed also empirical studies and a theoretical framework supporting the main issues addressed in this study.

Areas discussed were:

- 1 Theoretical Framework
- 2 Understanding Deafness and Communication
- 3 Voice Notebook
- 4 Utilization of voice notebook as a communication support for deaf students
- 5 Effectiveness of voice notebook as a communication support tool
- 6 Impact of Voice Notebook as an Alternative Communication Tool for Deaf Students



#### 2.1 Theoretical frame work

A theoretical framework is a structured explanation of theories and models that support a research study. It sets the stage for an understanding of the research problem, and guides the objects, hypotheses and methodology of the study. Theoretical frameworks also facilitate interpretation of findings and situate the study in the existing literature (Varpio et al, 2020).

In studying assistive technologies for students who are deaf, the Social Model of Disability (Oliver, 1990) is one theory that is a model for research and development. It stresses that barriers to inclusion are not in individuals but in the structures of society.

The Technology Acceptance Model (TAM) (Davis, 1989) can be used to assess deaf students' perceptions of the usability and usefulness of a tool such as Voice Notebook.

### ***2.1.1 Social Model of Disability***

The Social Model of Disability was introduced by Michael Oliver in his book "The Politics of Disablement" (Barnes, 2019). This framework puts the emphasis on the environment that creates disability, rather than on the impairment of an individual. It brings attention to the interaction of a person's handicap and the constraints his physical, social and psychological environment places on him.

The Social Model of Disability holds that "disability" is the social restrictions and prejudices, not the impairments that a person may have. According to Oliver, disability experienced by people with disabilities is caused by limitations primarily in the attitudes of society, inaccessible infrastructure and discriminatory legislation.

Based on the principles of the Social Model, this study looks at the usefulness of voice notebooks in aiding communication of the deaf students in St. John's Integrated Senior High Technical School, Navrongo. The research is done to find out whether voice-notebooks improve communication, participation, and empowerment for these students in higher education in Ghana (Trinidad & Ngo, 2019).

The model challenges the idea that disability is a personal failure, instead highlighting the constraints of society that make full inclusion impossible. For deaf students, these barriers often take the form of low communication opportunities with peers and instructors. By adopting the Social Model, the study recognises that the physical and social environments navigated on a daily basis have a significant impact on their experiences (Aldalur et al., 2021).

Voice notebooks solve the problems associated with communication by adding real time transcription and note taking. The Social Model maintains that those difficulties are caused by inaccessible communication systems, a lack of support and environments that were built for hearing people, rather than deafness per se.

In this research, the Social Model provides a lens through which one can understand the barriers created by a lack of communication support for deaf students, including a lack of sign language interpreters. Voice Notebook is in line with the theory by reducing environmental barriers by using assistive technology. By providing live transcription and note-taking, the tool is changing the learning environment to enhance communication, participation, and inclusion (Millett, 2023).

Thus, the Social Model shifts the emphasis of the study from limitations that come as a nature of being deaf to the role of institutional and technological adaptations in creating equitable education. Voice Notebook is a good example of an environmental intervention that lowers barriers and advances inclusive practises (Millett, 2023).

### ***2.1.2 Technology Acceptance Model (TAM)***

TAM is a potent framework that describes how people accept and adopt new technologies. Developed by Davis in the late 1980s, TAM posits the major factors in a person's intention to use technology as a perceived ease of use and a perceived usefulness, that in turn determines actual behavior as to use. Applying TAM to the integration of voice notebooks in the context of St. John's SHTS, Navrongo is a systematic approach for studying the uptake and effectiveness of the tool (Lersilp & Lersilp, 2019).

#### **How TAM can be applied**

**Perceived Ease of Use (PEU):** In this context, PEU means how easy the deaf students feel that they can learn and use the voice notebook. The study will determine whether the interface of the device and its performance is aligned with the cognitive and physical capabilities of the students (Granic & Marangunic, 2019). A positive relationship between PEU and intention to use the technology shows that the technology is seen to be accessible and user-friendly.

**Perceived Usefulness (PU):** In this case, PU refers to how much students believe that the voice notebook will help them learn and communicate. By evaluating how effectively the device works to overcome the communication barriers and foster good interactions, the research will determine the outcome of the PU (Sagnier et al., 2020). A strong relationship between PU and intention to use indicates that the tool is meeting a critical need for communication.

**Intention to Use (IU):** TAM assumes that intention is the key to initial use. This study will measure student's goal in implementing voice notebooks in communicating daily. The level to which PEU and PU affect IU will indicate the possibility of success of the technology (Rafique et al., 2020).

**Actual Usage Behavior (AUB):** AUB looks at the actual integration of the voice notebooks in the routine of students. By measuring the frequency of use and frequency of consistency, it is possible to compare the intention with the practise of using the tool in the pre-tertiary environment, discovering the feasibility of an adoption of the tool (Estriegana et al., 2019).

**Application and Implication (AP):** Application of TAM enhances the exploration of the compatibility of voice notebooks relative to the needs of deaf students. The model is used to explore important factors affecting technology uptake, which can be identified as facilitators and barriers. Mapping the relationships between PEU, PU, IU and AUB gives actionable insights for effective use of voice notebooks in education. TAM thus provides a strong foundation on which to build the understanding of technology acceptance as well as to help develop communication inclusivity for the deaf student (Salloum et al., 2019).

## **2.2 Understanding Deafness and Communication**

### ***2.1.1 Deaf Culture and Identity***

Deafness is more than a medical condition, it is a rich cultural identity based in language, community and shared experience. The deaf culture focuses on the fact that deafness is not a lack to remedy but a different identity to embrace. Being able to recognise this identity is important in education, where it is necessary to understand and accommodate the unique needs of deaf students. This discussion examines how voice notebooks can help close the gap between sign language users and the world of hearing (Fobi & Oppong, 2019).

### ***2.1.2 Deafness as Cultural Identity***

Deaf culture is a rich subculture with language, traditions, shared history, and belonging. Sign Language, the main language for many deaf people, is a complex language with its own grammar, syntax and semantics. It helps to unite the community and foster pride (Glickman, 2019). The community has increased in identity by defeating the discrimination, the audism and the education that have been the barriers for the community to attain resilience and support each other (Szarkowski & Toe,

2020). Viewing deafness as cultural identity is therefore of importance in addressing the educational needs of deaf students.

### ***2.1.3 Communication for Deaf Persons***

The exchange of ideas, information and emotions are possible due to effective communication. For people with hearing impairments, communication in the traditional fashion can be difficult. Deaf communication strategies such as visual communication such as sign language, speech reading and written communication have evolved to overcome these barriers. Technological advancements, such as voice notebooks, provide innovative solutions that have the potential to revolutionize the way deaf people communicate (Darabah et al., 2023).

### ***2.1.4 Deaf Communication***

Communication is the basis of human interaction and deaf people struggle because their auditory input is limited. Over the years, sign language, speech reading, and writing have been developed in order to overcome these challenges. While these strategies make communication experiences better, there are also limitations associated with them, particularly when it comes to academic spaces (Chang et al., 2020).

### ***2.1.5 Sign Language***

Sign languages are many languages with a distinct grammar and vocabulary, visual languages. ASL, BSL and other regional variations are potent tools through which fluent communication can take place within the deaf community. Sign language promotes meaningful interactions and social engagement but is a lesser means of interaction when partners are not fluent or when the use of written text is prevalent (Lillo-et al., 2023).

### ***2.1.6 Speech Reading***

Speech reading or lip reading is based on observing the movements of the lips and the face of the speaker. It provides worthwhile hints but is hard to master. Factors such as unknown pronunciation, background noise and the limited visual representation of English make it difficult to read speech accurately. In fast-paced lectures or complex subjects, lip reading is not very reliable, and it can impact an individual's academic performance (Prajwal et al., 2022).

### ***2.1.7 Limitations in the Academic Environment***

Academic environments require effective communication for learning, participation and overall experience. Deaf students often face some obstacles that restrict their participation in the classroom. Lectures, discussions, and group activities are problematic because of the limitations of traditional types of communication. Although sign language interpreters and note taking services are helpful, they are not always available and may not support real time interaction. These gaps highlight the need for better communication solutions (Schunk, 2023).

### ***2.1.8 Communication Challenges and Sign Language***

Communication is at the centre of the academic experience. However, when it comes to the deaf student, traditional spoken language can put up major hurdles. Deaf students tend to struggle with lecture, discussions and social situations as they are strongly dependent on written communication. This reliance is slowing down their real time engagement and understanding of academic content. Moreover, because they may struggle to fully express themselves, their participation and overall learning experience is limited (Bragg et al., 2019).

Sign language is an intrinsic component of the deaf culture and provides a natural means of communicating to deaf people. It permits nuanced expression, and thus enables students to share complex ideas and to be more active participants in intellectual discussions. However, the lack of interaction between sign language users and those with a primary spoken language capacity can result in misinterpretation and exclusion. It is important to bridge this gap to have an inclusive learning environment, which promotes diversity and a culture of teamwork (Sisto et al., 2022).

### **2.3 Voice Notebook**

In recent years, technological advancements have made new possibilities available in solving the communication problems of the deaf community. Voice notebooks, with voice-to-text and text-to-speech features, are also a potentially viable option as a communication aid. These are machines that support speech recognition algorithms to read and translate the words said by a user so that the deaf users can read and reply in real time. Text to speech capabilities then perform the process of rendering written input as spoken word and vice versa to build a two-way communication flow (Dube, 2020).

The emergence of technology is providing fresh possibilities for increasing access to information. Here, voice notebooks are identified as new innovative tools that have the potential of closing the divide between sign language users and the hearing community. By transferring the spoken word into text immediately, these devices allow deaf students to access auditory information visually, which will be closer to their linguistic preferences. Using a voice notebook, deaf students can access the content being spoken without having to rely on only speechreading or handwritten notes, and improve their understanding and participation. They can also review and process

information at their own pace - which is a significant advantage in a complex academic setting (Han et al., 2021).

The different opinions on the "Effectiveness of Voice Notebook as a Communication Support Tool for Deaf Students" show a great synthesis that addresses the many benefits of this technology. Scholars in the fields of education, technology, and communication studies all agree that the voice notebook is a versatile tool with major implications for inclusive communication (Park et al., 2021).

These viewpoints point to the flexibility and dynamic nature of the voice notebook. Whether viewed as a personalised speech-conversion device, or as an inclusive communication technology, it is a facilitator in many scenarios. Researchers highlight its interactive, empathetic and user-friendly nature, which was able to translate spoken language into written text without any hitch. This is a flexible approach, which assists in addressing the varying needs of deaf students, hence, breakdown of communication barriers (Wang et al., 2020).

Voice notebooks are more than gadgets: they are sociocultural interpreters who appreciate the nuances of context - specific communication. Pragmatically, they are useful speech-to-text converters that are more concerned about how well they work in real life (Xu et al., 2023).

In the field of education, the voice notebook is not simply considered a tool by scholars, but an integrated speech translator. The potential of using it in the learning environment promises to be a better experience for people with auditory challenges. This is consistent with the prominence of the study because the integration of voice notebooks at pre ternary level could fill the communication gaps of the deaf students (Shakhovska et al., 2019).

The cognitive aspect of the voice notebook is also emphasised. It is a cognitive speech-to-text processor that involves mental processes that are critical to clear communication. Many scholars have viewed it as a bridge across disciplines - a tool that spans various academic disciplines (Bahar et al., 2019).

The voice notebook focuses on the ease of textualization and flawlessly smooth transcription, which points to its practicality. It transcribes speech without interrupting the flow of communications and causing disruptions. This is consistent with the overall theme of pragmatism and the potential of the tool to overcome challenges felt by the deaf in educational settings (Dong et al., 2021).

Apart from being a device the voice notebook is an educationally integrated translator. Its impact is not limited to the classroom and its effects are felt in social interactions, working collaboratively, and overall campus life (Lero et al., 2019). As a cognitive processor, it assists the users in improving language processing skills (Nagdewani & Jain, 2020).

The shared views strengthen the fact that the voice notebook is not just a tool but a revolutionary in the communication processes. Its capacity as a dynamic speech - translation interface guarantees that it is pertinent in changing circumstances, to address changing needs in communication - particularly for those with auditory challenges (Pandipati & Sam, 2021). Its empathy design recognizes the nuance of emotions in people's speech, providing more than just function communication (Mroz, 2022). The voice notebook is a catalyst to enhancing verbal communication in general. It goes beyond individual users, which potentially impact educational policies and practises, thus bridging larger communication gaps (Gaber et al., 2020). Its contextual awareness enables it to adjust to different speech patterns and settings to be adaptable to a wide range of communication needs (Jose & Goyal, 2022).

## **2.4 Use of Voice Notebook as a Communication Aid for the Deaf**

Automated speech-to-text technology, including voice recognition software has now enabled "on the go" transcription for a variety of communication, occupation and educational scenarios (Raisi & Harthy, 2023). Businesses use speech-to-text captioning to enable access to people who are deaf or hard of hearing (their employees, clients, or customers) (Perez-Aguirre et al., 2024).

Speech - language processing utilises the power of transcription to translate audio into natural written language with NLP technology. This software is part and parcel with voice assistants, automatic speech recognition engines and speech analytics tools. Users are looking for inexpensive solutions that are easy to transcribe and transcribe the interactions that occur on a daily basis, particularly in educational settings (Connelly & Doyle, 2023). The most effective software is that used in classrooms. Educational leaders of colleges, universities and training providers rely on speech to text captioning to provide real time transcription in lecture halls and in online learning environments (Madahana et al., 2022).

Some hospitals do not have a sufficient number of interpreters or computers, particularly in emergency wards, outpatient departments, operating theatres and recovery areas. In such cases, the use of automated speech recognition software for smartphones is essential. It enables deaf people to translate the spoken language into captions on their phones, making it easy for them to communicate (Rizal et al., 2023).

Speech-to-text technology is an important development for students with deaf or hard of hearing. Captioning is a visual representation of the spoken language which helps students who have read - language skills to understand the message and identify any misunderstandings. Students with poor language or literacy skills may find captioning less useful if they are not able to read well (Findley & Gasparyan, 2022).

Irdamurni et al. Speech- to- text captioning can support Inclusive education: However, there are still some challenges in physical and online synchronous learning environments that require further attention. For instance, audio is frequently used in academic events, making it difficult for students with learning or physical disabilities, foreign students, and other student groups at greater risk to be able to access the content (Shezi & Ade-ibijola, 2020).

Recognition technology can be used to synchronise transcription of speech and share it on whiteboards or student computers (Levesque et al., 2023). Recent research has shown that speech-to-text (STR) transcripts are useful for students to better understand lectures, take notes during the lecture, and complete assignments (Pajorova and Hluchy, 2021). STR transcripts also provide an additional verification of spoken material, which can help students with learning or physical disabilities, students from foreign countries, and other at-risk populations (Adekola et al., 2021) understand the content. There are a number of studies that point out the pedagogical usefulness of STR. For example the Speech Recognition in Schools Project allowed the students to improve reading, writing and spelling skills with STR support. Kambouri et al. (2023) developed STR applications to help deaf students as well as non-native speakers during lectures. In a study from Lee and Park (2021), it has been found that the improvement in learning when there is a high accuracy of learning when in a university lecture theatre of both native and non-native English speakers.

A non-native English lecturer used STR in a course in information systems. Participants found the system helpful but that a better recognition accuracy was required. Millett (2021) used the STR technology to assist non-native English participants in learning in an English seminar. Most participants said that transcripts were useful for learning. 19 ways of using transcripts were discovered. Participants with

varying learning achievements made different use of transcripts. Hwang, Kuo, and others used the application of STR technology in online synchronous learning. Compared to those students who did not use transcripts, the students who did use them had improved results in terms of homework completion and post test results (Zhang et al., 2022).

STR technology was primarily utilised to support specific groups of students, including those who have learning or physical disabilities and foreign language learners, to ensure that they have the same access to learning (Mroz, 2022). The scope of research on the topic of STR technology expanded over time. Today, not only students with special needs but also the general student population use STR for improving understanding of the learning content, reflective writing, and homework (Gaber et al., 2020). Recent improvements, particularly in accuracy, have led to the use of STR in collaborative activities with multiple participants who speak at the same time, i.e., group conversations or oral presentations. This study summarises the development history of STR and usage by the various users. First of all, it reviews the use that has been given to STR in the last fifteen years in education through relevant research. Second, it shows how effective STR can be for different groups of students - students with learning or physical disabilities, foreign students, online students and students who study in a physical environment (Weigel, 2021).

Network traffic congestion can result in poor audio quality in a synchronous cyber classroom. In such conditions, students will not be able to hear the speaker, impeding online teaching and learning by disrupting the understanding and also reducing participation and interaction. To overcome this problem, Mishiwo et al. (2021) implemented Windows Speech Recognition to the Microsoft OS to utilise STR tools to

support different teaching activities (lectures, oral presentation, and discussions) and support communication for students in a synchronous learning environment.

In the modern education process, the desire to improve the learning process has resulted in the creation of some innovative tools and devices. Among them are voice notebook digital devices or applications which are designed to record and store audio information. A major area of investigation is that of voice notebooks in note taking and learning support. Studies by Widyana et al. (2022) in college settings indicates that students who use voice notebooks for note taking benefit in terms of information organization and retention of the course content. The ability to go back and re-play recorded lecture adds to understanding and can be used to fill in gaps in notes. Additionally, researchers such as Sand et al (2024) have conducted research on voice notebooks as learning support tools for learning disabled students, as students with dyslexia benefit from the use of voice notebooks to capture oral instructions as they reduce the need of written notes and enhance the understanding of the instruction.

Through studies such as that conducted by Irdamurni et al. (2020), it has been found that accuracy and fluency of spoken English are improved in English Language Learners when using voice notebooks to practise pronunciation exercises. Voice notebooks are also helpful to language proficiency for students learning sign language as a second language. Deaf students who are learning sign language have more fluency and expressive skills by recording and self-assessing regularly using a voice notebook.

Another field of investigation analyzes the use of voice notebooks for feedback and assessment. Voice notebooks are used by instructors to have the ability to give individual audio feedback on assignments and projects. The authors Sangeetha et al. (2024) tested the effects of audio feedback through voice notebooks on student

engagement and motivation and determined that students experience this type of feedback as more significant than the traditional written comments. Voice notebooks are also used in peer-assessment activities, which helps to provide more interactive and constructive feedback as students provide oral feedback to one another's work.

Voice notebooks have also become the facilitators of inclusion in classroom. Other researchers, such as Kambouri et al. (2023), investigated how they could be used to facilitate the inclusion of students with speech impairments. The results indicate that voice notebooks increase communication and participation among students with speech difficulties to create a more inclusive learning environment. In addition, voice notebooks are useful for students with physical disabilities that struggle with the traditional methods of writing. By taking advantage of voice-to-text capabilities, students with motor problems have an opportunity to take a more active role in written assignments and class activities.

The existing body of empirical work on voice notebooks (Shezi & Ade-Ibijola, 2020) has shown that it is a versatile tool that offers the potential for improving different teaching and learning aspects. These digital aids provide support for note taking, enhanced development of language skills, feedback and assessment support, and building inclusive practises. As technology continues to develop, the use of voice notebooks in a learning environment is something that should be further examined. We need more research that explores long term effects as well as applications on different levels and subjects at school. Finally, the results support the importance of voice notebooks as the efficient means of designing active and involving learning process in the contemporary education.

Although voice notebooks have potential positive effects, there exist difficulties to deaf students as well as empirical studies demonstrate. Shadiev et al. (2020) found that voice recognition accuracy was a major hurdle. Deaf students felt frustrated when the device did not transcribe their speech accurately and thus recorded errors in the content. The study also had concern over compatibility with different devices and platforms. Seamless synchronization and access of different devices such as smartphones, tablets, and computers are important for seamless communication and information management.

To overcome these challenges and maximise the implementation, the research work done by Hirai and Kovalyova (2023) highlighted the collaborative approach. By engaging with deaf students, instructors and disability service providers in regular meetings, changes and enhancements can be made in real time to help achieve higher acceptance and effective usage of voice notebooks. In another study, Findley and Gasparyan (2022) examined preferences and experiences of deaf students using various types of voice notebooks, in which they compared dedicated recording devices with mobile applications. While most students were more interested in the convenience and accessibility provided by the mobile apps, there were challenges in terms of battery life and storage limitations when recording long lectures. The research illustrated the need to take into account the preferences and needs of students when identifying voice notebook technologies.

Technical improvements, e.g. voice recognition accuracy, were singled out as possible obstacles to smooth usage. Fixing these glitches is crucial in order to ensure that the technology is capturing information effectively. Privacy and confidentiality issues also affect the level of comfort and compliance of deaf students when using voice

notebooks in common educational settings (Uskov & Varidireddy, 2019). Overcoming these apprehensions is an important step to promote acceptance as a dependable communication tool.

Finally, acceptance and comfort with technology play a major role in deaf students' acceptance of voice notebooks (Liu et al., 2019). The research showed that specific training and support is required to overcome initial resistance and to emphasise the value of voice notebooks for communication and information management.

### **Impact of Voice Notebooks as an Alternative Communication Instrument for Deaf Students**

The implementation of voice notebooks in learning institutions can revolutionize the learning process of the deaf students by significantly improving communication and interaction of the deaf students with academic subjects. Speech-To-Text software overcomes a major obstacle, namely the challenge in accessing spoken language in real-time. By including real time transcription, voice notebooks let deaf students track lectures, discussions, and other spoken interactions that may exist between them and their hearing peers, bridging the communication gap between them. This increased accessibility creates a more inclusive environment for students who are deaf and will encourage them to be able to actively participate, rather than only having to depend on interpreters or other outside aids. As a result, these students enjoy greater independence, and the dependency on third parties in communication is decreased (Fareed et al., 2024).

The psychosocial effect of voice notebook technology is quite significant as well. Deaf students feel isolated and marginalised simply because they cannot participate fully in verbal interaction with their peers and their instructors. Through

voice notebooks, students are given more control over their educational experience, self-confidence and a sense of belonging in the educational community are increased. Accessing spoken information independently decreases anxiety that results from dependence on interpreters or note-takers that can interrupt the flow or cause delays in communication. Moreover, this autonomy enables the deaf students to participate in discussions and group projects more effectively and communicate with the instructors. Improved interaction may result in greater academic success and greater integration in the academic and social aspects of school life (Bakken & Varidireddy, 2019).

Additionally, voice notebook technology could increase academic performance. According to Samonte et al. (2019), students that use speech-to-text tools such as voice notebooks have a better understanding of the course content and complete assignments and exam preparedness. The real-time nature of the technology gives students access to information as it is delivered to keep them on par with their hearing classmates. It also supports self-directed learning: students can study lecture notes and transcripts when they have the time to go over complex subjects. Such engagement is essential for success in academic endeavours because it allows students to strengthen the material that they learn and how they use it in assessments.

### **Effectiveness of Voice Notebook as a Communication Support Tool**

The integration of technology in education has resulted in different communication support tools. One such tool is the "Voice Notebook" used as a communication aid for students with deafness (Widyana et al., 2022). Communication is basic to human interaction and through it we can exchange thoughts, ideas, and information. Some people struggle with conventional methods because of various disabilities or conditions (Chen, 2022). Technology has brought about new innovations

to fill in the communication gap. One such solution is the "Voice Notebook" which allows users to transcribe spoken language into text (Yashina et al., 2022).

The software worked best when the user had a headset on, which may not be acceptable during a consultation. One group examined the use of automated speech recognition software in the generation of paediatric outpatient clinic letters. They found that software training and correction errors used twice the physician time compared a handheld tape recorder, though the letters were available the same day compared to one week with standard practise (Gaber et al., 2020). Mossige et al. (2023) reported the use of the same software for the generation of outpatient letters. They found it freed up the secretary's time for checking accuracy and increased turnaround time; however, it took time to train the system. We did not find any studies of automated speech recognition software used to communicate directly with patients, although the possibility has been described. Our study shows that smartphone automated speech recognition is far more speedy than writing or typing. Although results for dictation were not quite as accurate, the rate of error was only percent on average. In our experience, patients have little difficulty in understanding the text using this low frequency of errors.

There are lots of redundancies in many languages. Because of this, patients are able to understand the meaning of sentences even when some of the words are incorrect. Studies have shown this especially when it comes to deaf patients. The accuracy can be ameliorated by dictating slower. However, there are a number of factors that limit the use of this technology in clinical settings. On the iPhone, we tried the free Dragon Dictation application. It requires access to the internet via 3G, 4G, or Wi-Fi in order to process speech. Many clinical areas do not have cellular reception and some hospitals do not make wireless Internet available for staff. Uploading speech to the network

allows the app to learn how to communicate in different accents and words and get better over time. We expect the accuracy to increase with advancement of the technology. Another limitation is that a limited amount of text is displayed on smartphone screens. It is possible that patients with poor eyesight prefer tablet computers. Despite these limitations, however, we found the technology helpful in communicating with patients in the outpatient clinic and recovery ward (Shezi & Ade-Ibijola, 2020).

Real-time captioning is an important accessibility tool for many Deaf and hard-of-hearing (DHH) people (Shadiev et al., 2020). Most captioning research is based on formal situations and technical updates, but we looked at informal, interactive small groups of people chatting that is spontaneous and socially dynamic. This paper presents the results of semi-structured interviews and design probe activity with 15 participants of the DHH. We asked them about their usage of current captioning services, as well as their ideas of what tools needed to be developed in the future, in person and online. We found the quality of captioned small groups relies on social, environmental and technical factors - for example, pre-established relationships, the type of caption display, and the amount of lag. When thinking of new tools for captioning, participants expressed their desire for additional information about non-speech cues, such as the identity of the speaker, the pace and volume of speech. We provide a qualitative storey of DHH people's experiences in captioned small groups and suggest design directions that will better support both in person and online groups (Matre, 2022).

Most previous research on small group captioning focused on technical aspects such as demonstrating the uncertainty in automated captioning in simulated conversations (Yashina et al., 2022). Some studies have been done to investigate the

impact of social interactions in captioning (Al-Sarayrah et al., 2021). They first found that when hearing people know they are being captioned they start to speak more loudly, more clearly, faster, and with non-standard articulation, when in a small group. In a follow-up study a hearing actor varied conversational behaviours (rate, volume of speech, and use of eye contact), and measured what conversation styles were preferred (fast, medium, or slow) and which behaviours were most important by DHH participants. Their quantitative data revealed that hearing people's behaviours influence DHH people's experiences of captioned conversations, both individual and group. These results underscore the importance of using a sociotechnical understanding of small group captioning.

The study interviewed 15 DHH participants, and conducted a design probe within each of them. An interview began by talking about their experience using real time captioning in small groups and how hearing partners facilitate or inhibit accessibility. After the interview, participants went through a design-probe activity. It provided a set of possible features that could be added to captioning in the future, such as indicating the speech rate, indicating overlapping speakers and allowing hearing speakers to correct mistakes, and asked them to discuss what they need, and how this would fit in small group conversations. Our results indicate that a large number of social (group norms, preferred means of communication), environmental (room layout, availability of online chat) and technical (lag between captioning and speaking, identification of the speaker) factors influence the use of real time captioning. In short, the effectiveness of captioning is group-dependent, tools are often not effective for interactive use, and the online environments have barriers as well as new opportunities.

Participants' responses to the design probe also suggest that we can create more caption friendly environments, both in person and on the web. They see value for offering conversational feedback and warnings that might help groups create caption friendly norms. Based on these results, we propose that social, environmental, and technical factors should be considered in captioning research together. We suggest rephrasing captioning as group technology, and propose design guidelines that have a focus on the needs of DHH people. Overall, we contribute (1) an empirical account of the experiences of the participants in DHH that highlight the impact of social, environmental, and technical factors, (2) understanding of the opportunities for designing captioned small group conversations, (3) understanding the impact of online environments which are historically understudied, (4) an understanding of framing captioning as a group technology. There is no clear guideline for an acceptable level of accuracy in the literature as to an acceptable level of accuracy for average consumers. Even the Described and Captioned Media Programme, an important online resource for providers and consumers, does not offer a standard other than that "errorless captions are the goal" (Shakhovska et al., 2019).

### ***2.6.1 User Experience and Acceptability***

The usefulness of any type of assistive technology is dependent on the extent of its acceptance and use by the intended users (Sagnier et al., 2020). Alfadda and Mahdi (2021) examined the experience of the Voice Notebook with people with motor disabilities. They found high levels of user satisfaction and perceived usefulness, which resulted in improved levels of confidence and engagement in communication tasks. Voice Notebooks also have the potential in education and learning languages too. Using a Voice Notebook helped dyslexic learners to improve their reading and writing skills, and thus become more independent learners (Shin, 2021).

### ***2.6.2 Cultural Inclusion and Technology power.***

The use of voice notebooks in education is a sign of cultural inclusivity and technology empowerment. It has a positive value for sign language and positive ways of communication which help Deaf students to feel belonging, and model a society with respect for linguistic diversity (Szlavi & Guedes, 2023). The use of voice notebooks is based on the principles of the Universal Design to Learning (UDL). UDL encourages multiple modes of representing information, engaging and expressing in order for all students (no matter their communicative preferences) to equally access content (Mukherjee, 2020). Deaf culture is not just a medical terminology, it is a rich culture of language, history, and experience. Voice notebooks may be a bridge between the worlds of sign language users and the hearing world. By translating words spoken by the teacher into real-time text, the technology allows Deaf students to actively participate in academic content and preserves one's cultural identity (Mphahlele & Maguvhe, 2021).

### ***2.6.3 Multilingual Support***

Multilingualness is critical to voice notebooks, particularly for people who have a motor disability or come from diverse linguistic backgrounds (Edwards, 2019). Davila and Bunar (2020) found that by adding multiple languages, users get to interact in their own tongue, which reduces barriers and increases inclusion. This is essential to those with limited ability of movement, as they have the power of effective communication without the restriction of language. Voice Notebooks are suitable for use in many languages; studies have been conducted to use them with different cultures. Gitschthaler et al. (2024) revealed that through multilingual support, people with language barriers were able to communicate and become included among the community. Overall, the addition of a large number of languages makes the tools easier

to use and enhances the user experience. In a recent study conducted by Langeloo et al. (2019), the authors found that people were more satisfied with using their native language, which reduces mental effort and promotes natural interaction, which results in a higher adoption rate and longer use duration. Real time translation, based on a new technology in natural language processing, also contributes to seamless communication across languages. NLP and machine learning are important in making these features possible but there are challenges, such as dialect variations that compromise accuracy. Reliable multilingual capability is currently under research. Multilingual support also implies acclimatization to cultural situations voice notebooks with culturally sensitive interfaces and greetings make one feel at home. In Ghana, dialect variations have resulted in difficult to accomplish anticipated outcomes (Buxton & Caswell, 2020). This is a study of the support provided to Deaf students by voice notebooks in Ghana.

#### ***2.6.4 Technology Adoption in Pre Tertiary Education***

Recent years have witnessed the rapid development in educational technology. Schools and homes invest a lot of money on computers, software, and Internet and transform traditional classrooms into digital classrooms that strive to create a more fascinating learning experience (Alruwaili, 2024). The introduction of computers and other related technology, called Information and Communication Technologies (ICT), introduces learners to the information era and opens up more opportunities (Abraham, 2023). In many of the developed countries, ICT use in education is the norm (Tandi et al., 2023). In the US, almost every public school uses computers with Internet for teaching (Yalley, 2024). Adding ICT has helped teachers and students to improve their skills, encouraged knowledge sharing, and enhanced teaching and learning (Abedi, 2023). ICT tools enable teachers and learners to move beyond the walls of classrooms and support and transform education (Abedi et al., 2024). With the help of technology,

teachers do not need to be in front of the students to provide quality and efficient lessons. ICT helps with keeping learners interested, how it supports distance education along with the flexibility, interaction, active learning, and collaboration (Akore et al., 2023).

Ghana, as well as several other countries, is of the opinion that ICT can be used to equip students for the job market and facilitate social, political and economic development (Asante et al., 2024). In response, the government has developed a national ICT policy and made a huge investment to make ICT education accessible to all Ghanaian students (Asare-Aboagye et al., 2024). The policy, backed by legal and legislative tools, entails the integration of ICT in curriculum and ensuring every student has access to ICT resources (Oduro & Yalley, 2022). Schools are responsible for planning and facilitating the use of computers and other related technologies for teaching, learning and other educational activities (for example, through offline or online e-learning platforms) (Rafiq et al., 2022). While the successful integration of computers has enormous benefits, Ghana has a lot of setbacks that the process is encountering (Adarkwah et al., 2024).

According to Adarkwah and Huang (2023), the effectiveness and impact of computer technology in education are dependent on the availability of skilled teachers who are capable of effectively deploying the technology. In order for computers to enhance learning, schools also need reliable internet (either shared through the local or campus networks), computer-assisted and television-assisted programmes and consistent power (Davlikanova & Hofstetter, 2020). Famodimu et al. (2024) add that internet-enabled computers, projectors, small boards, printers and photocopiers need to be available for teachers to develop and re-use free open- educational resources (OER).

Without these tools, computer-aided instruction is not possible as this affirms the observation by Ntumi et al. (2023) about Ghana's backwardness regarding the computer-to-student ratio of 1:150 compared to 1:15 in developed countries. The disparity indicates low ICT facilities and a digital skills gap, which presents ICT integration is dependent on the availability of tools.

While the ICT policy of Ghana has become prominent in the major cities (Bando et al., 2024), the logistical and infrastructural problems, the accessibility problems, and the disparity between theory and practise still persist (Tindan, 2021). Rural schools also battle with unavailable computers, poor internet connectivity, and poor power (Gyebi, 2023; Yong et al., 2023). Many facilities do not even have access to basic electricity, making the acquisition of computers meaningless (Langeloo et al., 2019). Those few schools which have access to labs often have internet deficits or erratic power supply (Zhang et al., 2022). The efforts of the government to integrate ICT comprehensively at all levels persist, although more needs to be done (Seita, 2020). Lack of access to ICT resources and limited skills by teachers pose challenges to the effective implementation of the policy (Lee & Park, 2021). Even with the availability of computers, most teachers are not trained to use them, and thus they are unable to deliver a lesson in computer usage. Consequently, a large part of teachers are not computer literate, many teachers have never used computer or projector for teaching (Fobi & Oppong, 2019). Some teachers are afraid of computers and think they are complex and do not want to learn how to use them.

Sinha and Kumar (2024) emphasise that teachers are the key players in the integration of ICT and have to undergo regular workshops, seminars and in service training to refresh their skills. Effective classroom use of computers depends on

availability as well as competence of teachers (Santoso et al., 2020). Ghanaian teachers also typically have insufficient ICT-focused training while in college and scarce time for ongoing learning after graduation (Schlotterbeck et al., 2022). Therefore, it is important for teachers to be equipped with up-to-date knowledge and skills to be able to integrate ICT successfully (Millett, 2023). Proficient teachers can research, enhance the content of curriculum, and present reliable and updated information to students and this is in line with the argument that education quality is dependent upon teachers who can effectively utilise technology (Aprilia & Nisa, 2022).

Research is starting to focus on what computer technology actually offers in education besides its perceived benefits (Zhao et al., 2022). While some focus on opportunities, others note that being stuck on technology erodes important thinking skills and problem-solving skills as students tend to copy online information rather than create their own. The convenience of technology may result in memory and independent thought decline (Nugroho, 2019). In this digital age, derivative work is created by many students and teachers, and often the sources are misappropriated or plagiarised, which results in a lack of academic integrity (Wu et al., 2023).

Administrative expenses also create problems, where the cost of computers and other related equipment increases, which is a burden on schools (Caselli et al., 2020). High cost of PCs, internet, projectors, tablets and smart boards hinders integration, particularly in the post covid 19 scenario where prices are up to almost double. In the current economic situation and the pandemic effects, most schools and individuals cannot afford these devices that have become luxuries although they are necessities (Stoian et al., 2020).

## **2.7 Empirical Review**

This literature review attempts to examine and analyse existing empirical research on the use of voice notebooks or other similar technologies as alternative forms of communication support for deaf people. The review is in-depth about the effectiveness, benefits and limitations of voice notebooks, which can give an understanding of the impact of voice notebooks on communication, academic performance and social integration of the deaf population.

### ***2.7.1 Communication Devices and Application***

Building on the success of sign language interpreters, voice notebooks have become a possible communication support for deaf students in the higher education system. Banafaa et al. (2023) conducted a study in two phases with 24 deaf university students and 10 instructors in the form of a qualitative study. They found that more than 80 per cent of students reported better lecture comprehension with the use of voice-to-text features along with classroom instruction. Structured training allowed more consistency and confidence in the use of the application to note-taking and revision. These findings confirm the earlier findings of Khanna and Kaur (2020), who found that systematic training increases the usability and effectiveness of assistive communication technologies.

Pradhan, N. N., Jahari, A., & O'Leary, I. (2021) A mixed-methods investigation of deaf and hard of hearing deaf students. Students who were trained in organising, saving and retrieving transcribed notes had a 35% increase in accuracy with task completion tasks compared to students who used the tools without guidance. The role of ongoing technical support was also addressed in this study: Students with access to

troubleshooting services were less interrupted during learning activities (Shadieff & Yang, 2020).

The field of augmentative and alternative communication (AAC) has advanced at a great rate in recent years. Bell and Leabman (2019) recorded the myriad of devices and applications available to support individuals with varied communication needs including those who are deaf.

Beyond voice-notebook applications, there has been much empirical research on the use of AAC devices in the broader support of deaf students. Alpmann et al. (2020) have conducted an experimental study with 48 deaf students using dedicated speech-generating devices and mobile AAC applications. The results included a statistically significant increase in classroom participation. Prior to the intervention, students had participated verbally or textually in discussions almost twice as often as before. Teachers found better interaction between deaf and hearing students. These devices have demonstrated promising results in increasing communication abilities, especially in the speech or language impaired student. They help the students to express themselves effectively, participate actively in classroom discussions and communication interactions inside and outside the academic setting (Barzegar et al., 2020).

Karp et al. (2020) evaluated the effectiveness of speech generating AAC devices in 32 deaf secondary school students over a 12 week intervention. Pre-test and post-test results showed an increase in scores from 2.8 to 4.1 on a 5-point scale, showing a significant improvement in expressive communication skills. The devices enabled students to generate spoken language from the selection of symbols or text typing which was converted into speech. The results indicate that academic communication and

language (ACL) tools help students to express academic ideas, ask questions, and become more active in classroom activities (Jaehyuk and Jeong, 2020).

In a related study, Mikhaylov et al. (2019) examined AAC mobile applications in a discussion within a classroom by 45 deaf students. Seventy-two percent of participants actively participated in discussions in class when AAC apps were used as compared to 38 percent engagement without the assistance of the technology. The real time display of the typed responses fostered inclusive participation and collaborative learning.

Long term benefits of AAC technology were clearly demonstrated by Mottla et al. (2019) in a longitudinal study of 20 deaf university students over two academic years. Sustained improvements in academic communication, social interaction and self confidence were found in the study. Students reported a greater level of independence and less dependence on interpreters, which has resulted in them having improved peer relationships and feeling generally well. They also reported an increase in confidence in their communication skills, which improved the social connection and overall well-being.

The effect of AAC devices on academic performance is constantly confirmed by research. Arif et al. (2019) presented a meta-analysis of 18 AAC intervention studies and found a moderate to large effect size ( $d = 0.65$ ) on the academic outcomes. The analysis indicated steady improvements in terms of reading comprehension, written expression and classroom engagement in deaf students who used AAC tools, as compared to deaf students who did not use them.

## 2.8 Gap in Literature

In the area of alternative communication support for deaf students in pre-tertiary education, there is already literature that offers valuable information about the use of assistive technologies including the use of sign language interpreters, text-to-speech, etc. While there have been studies using interpreter with facilitated communication, studies using digital tools such as voice notebook are scarce and this holds true in the context of Ghanaian pre-tertiary education.

Very few studies are done regarding the use of Voice Notebooks for student-deaf individuals in the academic setting. General research implicates the potential of speech-to-text applications, however, empirical evidence on the integration of Voice Notebook into classroom activities, assessments and peer interaction especially in environments where sign language predominates is lacking. Understanding how this tool can be used practically in a subject and instructional methods is essential in optimizing the tool's use in inclusive classrooms.

Moreover, studies on assistive technologies have usually measured general effectiveness but little research has been done to investigate the perception of the effectiveness of Voice Notebook as a communication support tool by Ghanaian pre-tertiary students. Current research does not adequately explore the accuracy of transcription, ease of use or ability for real time application and leaves a gap in understanding the true impact of transcription in the accessibility of communication for deaf students. Without these insights, efforts to implement Voice Notebook may falter because of misalignment with the specific needs and expectations of students.

Additionally, there are few studies looking at the larger impact that Voice Notebook has on academic performance, social interactions and confidence levels of

deaf students. Existing literature is concerned with the traditional methods of support, e.g. sign language interpreters, and does not analyse how Voice Notebook compares in terms of fostering engagement, understanding and participation in class discussions. Research on long term benefits, including its impact on language development and other academic achievement, is limited.

Finally, how educators view Voice Notebook in inclusive classrooms has not been widely studied. Understanding the attitudes, experiences, and challenges of teachers in implementing this technology is important for the effective development of training programmes and the seamless integration of the technology into the curriculum. Without empirical research on these issues, policymakers and educators may experience challenges in incorporating this tool for improving communication with support for deaf students.

It is important that these gaps are addressed in order to shape inclusive and effective communication support strategies in pre-tertiary education. Research, which focuses on the practical utilization, perceived effectiveness and overall impact of Voice Notebook will provide to a more complete understanding of the role of Voice Notebook in enhancing accessibility and academic achievement of deaf children in Ghanaian schools.

## **2.9 Summary of the Literature Review**

The literature review chapter focuses on the topic of "voice notebook as an alternative communication support for deaf students in St. John's Integrated Senior High technical high school, Navrongo." It is divided into three main parts Conceptual Review, Theoretical Review, and Empirical Review and each of which contributes to a complete understanding of the subject.

In the conceptual review, the researcher examines alternative communication support, taking voice notebook as one. Digital tools are defined and their features and applications are analysed in detail. The importance of alternative communication support for the deaf student in particular in higher education is emphasised. Challenges involving communication barriers and social-emotional aspects point to the need to have effective tools, such as voice notebooks.

The theoretical review examines the theories of communication that apply to the experience of deaf students. The Social Model of Disability and the Communication Accommodation Theory are important models to understand their unique perspective. The review also covers technology acceptance theories, such as the Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology, which is informative to voice notebooks adoptions. Additionally, there are the Universal Design for Learning (UDL) and Cognitive Load Theory that provide insights for incorporating voice notebook in educational environments.

The empirical review contains a detailed analysis of the research already conducted on alternative communication support and the use of voice notebooks in education. Findings relating to sign language interpreters, communication devices and apps are explored. Case studies are provided to show examples of inclusive classrooms and the use of voice notebooks in helping with communication skills and academic performance. A review of studies specifically related to the use of voice notebooks in higher education identifies successful implementation strategies and problems. Throughout the review gaps in the existing research are identified which points to areas which need further exploration. These gaps highlight a need for further studies on Voice

Notebook for the deaf and its potential at St. John's Integrated Senior High Technical School, Navrongo that is yet to be explored.

The researcher chooses a theoretical framework for the study, providing justification and explanation of the choice. This literature review lays a solid foundation for the study by offering an overview of voice notebooks as an option for communication support for deaf students with higher education. The insights that will be gained will inform further chapters and serve to develop evidence-based recommendations for the implementation of voice notebooks at St John's Integrated Senior High Technical School, Navrongo.



## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter presents the methods and procedures used to collect and analyze data for the study. The areas covered were: philosophical underpinning, research approach, research design, population, sample size, sampling techniques, instrumentation, the procedure for data collection, methods of data analysis and ethical considerations.

#### **3.1 Philosophical Underpinning**

The research in this thesis is epistemological positivist. This framework has been selected because the study emphasises the use of objective measurement, in an experimental setting in which statistical analysis has been used to determine cause and effect relationships between Voice Notebook use and academic performance. Positivism believes that knowledge is derived from objective empirical observations of the world and reality is independent of human perception. It can be understood by systematic observation, experimentation, and analysis and it supports the idea that phenomena can be quantified and studied using the scientific method (Godwin et al., 2021).

In this study, the positivist paradigm is a good fit as it seeks to establish the effect of the Voice Notebook technology on the communication skills and language development of the deaf students. Through a well-designed training initiative and a stringent research design, the study will attempt to objectively measure the relationship between Voice Notebook application and quantifiable changes in the communication outcomes of the subjects (Class et al., 2021).

Positivism is a focus on objective observation and measurement (Park et al., 2020). This study makes key variables related to communication skills and language development operational and so is able to quantify them and empirically assess them (Pease, 2020). Pre and post test measures and well-designed assessments during training and post training experiment ensure systematic and reliable data collection free from bias of the researcher (Ahmed & Ishtiaq, 2021).

Statistical tools such as IBM statistics reinforce positivist approach as they allow the data analysis to be precise (Ramancha, 2025). Descriptive and inferential statistics are useful in discovering patterns, testing hypotheses, and reaching conclusions based on numerical evidence (Amrhein et al., 2019). Positivism is associated with adherence to rigorous, quantifiable evidence, which is evidenced by the use of tests of statistical significance, confidence intervals, and regression analysis (Omodan, 2022).

Within the positivist framework, research questions are answered numerically during the study. It begins with some well-posed questions regarding Voice Notebook's potential impact on the communication skills of deaf students. These questions are verified by the collection of quantitative data. The results corroborate the results of the study (Hayre et al., 2022).

Positivism also favours generalisation of findings so that insights could be transferred to the larger population (Ali, 2024). By selecting a careful sample and having standardised data collection instruments, the study intends to generate results that apply to not only the participants, but also to other deaf students who can benefit from similar interventions (Turyahikayo, 2021).

A special dimension to positivist research is the establishment of causal relationships (Ali, 2024). This study has an experimental design that explores the causal impact of Voice Notebook intervention in communication abilities and language development. By controlling extraneous variables and employing a pre-test, post-test design research isolates the impact of an intervention and makes valid inferences about the effectiveness of that intervention.

The organised training programme, along with the close monitoring of the training participant's progress, provides a controlled environment in which to systematically manipulate the independent variable (voice notebook use). This control makes it possible to confidently attribute observed changes in the dependent variables (communication skills and language development) as a result of the intervention as opposed to external factors.

The positivist approach emphasizes the role of replicability and objectivity. Detailed documentation of the research design, methodology and analytical procedures ensures that the study can be replicated by other scholars, adding to the larger body of scientific knowledge. Objective methods of data collection and standardised analysis tools also contribute to the reliability and validity of the results.

### **3.2 Research Approach**

The research was conducted using a quantitative research approach and extensively analysed the effectiveness and viability of using a voice notebook as an alternative support for communication for deaf students at St. John's Integrated Senior High/Technical School, Navrongo. The approach was made to find out how deaf students can use voice notebooks to enhance their learning in class in a systematic approach (Baron & McNeal, 2019). The rationale for this research is the understanding

that rigorous quantitative methods are necessary in order to convey empirical evidence that help to substantiate or negate the utility of voice notebooks so that the conclusions about how voice notebooks affect their efficacy are well-founded and scientifically sound (Groot, 2020).

A quantitative approach was suitable because the quantitative approach collects and analyses numerical data in order to test hypotheses and answer research questions. It is appropriate for studying relationships between variables and making generalisation to a population. This study specifically aimed at examining the extent to which voice notebooks can enable communication among the deaf students, the extent to which they can be used effectively at St. John's Integrated Senior High/Technical School, Navrongo and the extent to which these notebooks can influence language development. These objectives more or less required a systematic and data-driven approach that could provide the empirical insight as well as the statistical analyses so as to support the scientific validity and precision of the study's findings (Al-Abbabneh 2020).

### **3.3 Research Design**

This study adopted an experimental research design in exploring Voice Notebook as an alternative communication support of deaf students in St. John's Integrated Senior High/Technical School (SHTS), Navrongo. The experimental design was selected as this research design method has it as an ability to establish the cause and effect relationship by using random assignment to control for extraneous factors to enhance the internal validity of the research (Rogers & Revesz, 2019). This way it is possible to ensure that outcome differences can be attributed to the intervention, rather than, for example, pre-existent conditions among participants.

In order to do this, students were randomly assigned either to the control group (39 students) or experimental group (40 students). The experimental group was the group who received Voice Notebook technology, and the control group were those who had been using traditional methods such as sign language etc. This randomised controlled approach allowed for a direct comparison between those who used Voice Notebook and those who did not in order to rigorously assess the impact of this tool on communication abilities [Miller et al., 2020]. Randomization mitigated selection bias and enhanced reliability of results on the effectiveness of Voice Notebook in enhancing accessibility of communication.

### **3.4 Population**

The population for the study was seventy-nine (79) deaf students of the St. John's Integrated Senior High Technical School, Navrongo which consists of forty-two (42) males and thirty-seven (37) females from across all departments deaf students are admitted in the school. The population was chosen for the study because, all deaf students in the school have used sign language from their basic school levels up to the senior high school level and hence, stand the chance to make an informed judgment on voice notebook as a worthy alternative communication support for deaf students.

**Table 1: Population of Deaf students of the St. John’s Integ. SH/Ts**

<b>Class</b>	<b>Population</b>	<b>Target</b>
Preparatory class	30	30
SHS 1	19	19
SHS 2	14	14
SHS 3	16	16
Total	79	79

**Source: St. John’s Integ. SH/Ts (2024)**

### **3.5 Sample Size**

The sample for this study comprised seventy-nine (79) deaf students drawn from St. John’s Integrated Senior High Technical School, Navrongo. The participants included forty-two (42) males and thirty-seven (37) females, reflecting a relatively balanced gender distribution. All participants were eighteen (18) years and above and represented different stages of their secondary-level education.

All students were either prelingually or postlingually deaf and had been assessed during their basic school education as requiring sign language as their primary mode of communication. In line with the school’s inclusive education practices, each class is supported by a dedicated sign language interpreter to facilitate communication between deaf students, teachers, and hearing peers.

The participants were drawn from different academic programmes and class levels, including Pre-class, Form One, Form Two, and Form Three, to ensure broad representation across the school. To examine the impact of Voice Notebook, the students were assigned into two groups: an experimental group and a control group.

Using random assignment, forty (40) students were placed in the experimental group, where Voice Notebook was introduced as an alternative communication support tool during instruction. The remaining thirty-nine (39) students formed the control group and continued with the conventional mode of instruction using sign language interpretation only, without the use of Voice Notebook.

This method of group assignment ensured comparability between the two groups, minimized selection bias, and strengthened the internal validity of the study by allowing observed differences in outcomes to be attributed to the use of Voice Notebook.

The participants were drawn from various academic departments within St. John's Integrated Senior High Technical School, further enhancing the study's inclusivity and interdisciplinary representation. A significant portion of the sample, thirty (30) students, were enrolled in the preparatory class, indicating a strong presence of students with direct affiliation to specialized educational practices. Additionally, participants represented various academic programmes, including:

- 1 **Home Science:** four (4) students from Food and Nutrition two class, seven (7) in Clothing and Textiles one class, six (6) in Home Economics 2A class (Clothing), and seven (7) in Home Economics 3A clothing class.
- 2 **Visual Arts:** nine (9) students from Visual Arts three (3) class.
- 3 **Technical Studies:** two (2) students from Technical two (2) and nine (9) from Technical one (1) class.
- 4 **Other Specialized Classes:** three (3) students from Food and Nutrition one (1) class.

It is important that the selection criteria for participants were precise, with the researcher specifically targeting individuals with a minimum of one semester of academic experience within a senior high school setting. This criterion was instrumental in ensuring that the chosen participants possessed a substantial level of familiarity with the academic environment, providing a robust foundation for their perspectives and experiences to be considered in the study.

This comprehensive approach to participant selection not only acknowledges the diverse academic backgrounds within the school but also lays a solid foundation for a nuanced exploration of the impact of voice notebook technology on the communication experiences of deaf students at the St. John's Integrated Senior High Technical School, Navrongo.

### **3.6 Sampling Technique**

The study employed a census sampling technique for participants selection (Stratton, 2021). The rationale behind choosing this approach was the availability of a relatively small and well-defined population, the entire cohort of deaf students enrolled at the St. John's Integrated Senior High Technical School, Navrongo. Unlike traditional sampling methods that involve selecting a subset of the population, a census approach involves including every single member of the population in the study (Babii, 2020).

By opting for a census approach, the study aimed to ensure comprehensive representation. Since the population of deaf students at the St. John's Integrated Senior High Technical School, Navrongo was relatively small, it was feasible to include all eligible participants. This method guaranteed that no potential participant was excluded, thus reducing the risk of bias related to sampling. Census sampling inherently reduces sampling error to zero because it includes the entire population. This level of precision in participant selection was deemed advantageous in obtaining highly

accurate and reliable results. It allowed for a detailed and precise examination of the impact of voice notebooks on communication and language development among deaf students (Zawacki-Richter et al., 2019).

As the research sought to explore the experiences and perceptions of a very specific group, of deaf students in a pre-tertiary education setting, the census approach provided the opportunity to gather comprehensive data directly from the entire population of interest. This allowed for a focused investigation into the effectiveness of voice notebooks for this particular demographic. Census sampling eliminated the risk of sampling bias. Since all eligible participants were included, there were no selection biases that might occur with other sampling techniques. Consequently, the findings of the study were less likely to be skewed or influenced by how participants were selected (Pandey, 2021).

Given the elimination of sampling error and the inclusion of the entire population, the study aimed for a high level of internal validity and reliability. Results could be attributed directly to the population of deaf students at the St. John's Integrated Senior High Technical School, Navrongo, enhancing the robustness of the research.

### **3.7 Instrumentation**

This study employed two main research instruments:

1. Achievement tests (pre-test and post-test exercises), and
2. A structured questionnaire.

These instruments were selected to generate both objective data on academic performance and subjective data on students' perceptions of the effectiveness of Voice Notebook as a communication support tool.

Achievement Tests (Pre-test and Post-test Exercises)

The first instrument consisted of achievement tests administered as pre-test and post-test exercises in English Language and Social Studies. These subjects were selected because they are language-intensive and require high levels of comprehension, interpretation, and classroom interaction, which often pose challenges for deaf students who rely heavily on sign language interpretation.

Each test contained 20 objective questions, comprising:

- 10 items in English Language, focusing on reading comprehension, vocabulary, sentence construction, and basic grammar; and
- 10 items in Social Studies, covering comprehension of social concepts, short passages, and interpretation of factual information aligned with the school syllabus.

The total score for each test was 100 marks, with English and Social Studies contributing 50 marks each. The questions were drawn directly from the approved St. John's Integrated Senior High Technical School curriculum, ensuring content validity and relevance to students' classroom learning.

#### Deployment of the Tests

The pre-test was administered to both the experimental group and the control group before the introduction of the Voice Notebook intervention. This established a baseline measure of students' academic performance.

Following the pre-test, students in the experimental group were introduced to and trained in the use of the Voice Notebook application, while the control group continued with regular instruction supported only by sign language interpretation. The intervention period lasted eight (8) weeks, during which Voice Notebook was used during classroom instruction for real-time speech-to-text transcription.

At the end of the intervention period, the post-test, which was equivalent in structure, content coverage, and difficulty level to the pre-test, was administered to both groups. The difference between pre-test and post-test scores was used to determine the impact of Voice Notebook on academic performance.

### **Structured Questionnaire**

The second instrument was a structured questionnaire designed to collect data on students' perceptions of the use and effectiveness of Voice Notebook as a communication support tool.

The questionnaire consisted of 15 closed-ended items, organised into three sections:

- Section A (5 items): Use of Voice Notebook for communication tasks such as note-taking, recording reminders, and engaging in classroom activities;
- Section B (5 items): Perceived effectiveness of Voice Notebook in enhancing understanding, participation, and communication access;
- Section C (5 items): Ease of use, satisfaction, and overall usefulness of Voice Notebook in the learning environment.

All items were measured using a five-point Likert scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree. This design allowed for quantitative analysis of students' perceptions and aligned directly with the study's objectives and research questions.

The questionnaire was administered only to students in the experimental group, as they had direct experience using the Voice Notebook during the intervention period.

### **3.8 Data Collection Process**

The data for this study were collected using two main instruments:

1. Achievement tests (pre-test and post-test class exercises) in English Language and Social Studies, and

2. A structured questionnaire designed to gather students' perceptions of the use and effectiveness of Voice Notebook.

Permission to conduct the study was obtained from the Headmaster of St. John's Integrated Senior High Technical School, the Assistant Heads, and Heads of Departments through an introductory letter issued by the Head of Department, Department of Special Education, University of Education, Winneba.

As a pre-test and post-test instrument, the achievement tests were given as class exercises in English and Social Studies. They assisted in assessing the academic performance of students before and after the intervention. The questions were written on a marker board and given as a class test to provide a baseline of knowledge and skills in the chosen subjects. The pre-test was given to both the experimental and control group in order to determine prior learning gaps and benchmark them to post-intervention comparison.

The research was conducted with a pre-test - post-test experimental. The intervention in the experimental group was the Voice Notebook intervention and the control was regular instruction without the technology. In order to ensure smooth administration, the researcher trained school sign- language interpreters for two days on the purpose of the study and procedures for administering the tests and questionnaires.

After the intervention the structured questionnaire was administered to students of the experimental group. Trained sign language interpreters, who were assigned to the preparatory class, technical classes (Forms 1-3), Home Science and Visual Arts, administered the questionnaire. This approach helped to reduce anxiety and ensure clarity because students were familiar with the interpreters. The data collected in the

questionnaire was related to the students experiences, perceived effectiveness and ease of use of the Voice Notebook as a communication support tool.

### **3.9 Validation and Reliability**

Validity and reliability were determined in order to ensure the instruments were measuring what they were intended to measure. Content validity for the pre-test and post-test achievement exercises in English and Social Studies was achieved through matching the items with approved school curriculum and learning objectives. The items had been developed and reviewed by two experienced deaf-students teachers to ensure they represented the content areas that were to be assessed.

Face and construct validity of the questionnaire was confirmed by expert review. The items were examined for clarity, relevance and appropriateness by specialists in deaf education and assistive communication technology to measure student perceptions about the Voice Notebook as a communication support tool. The items reflected important constructs such as communication support, ease of use, and perceived effectiveness to ensure the correct variables were captured.

Reliability of the questionnaire was assessed using the alpha of Cronbach. After pilot tests were conducted, the alpha for the three item scale measuring Voice Notebook use was 0.83, which denotes high levels of internal consistency. According to Tavakol and Dennick (2011), an alpha of 0.70 or above is acceptable for educational research. Thus, the reliability of the questionnaire to measure the same construct for the main study was found.

### **3.10 Ethical Considerations**

It is important to practise ethical research when conducting research on students, especially those with hearing impairments. First, the informed consent was obtained. Students and their guardians were fully informed about the purpose, procedures, risks and benefits of the study and informed that they could withdraw from the study at any time without penalty. This ensured voluntary participation on the basis of a clear understanding of what the study involved.

The study also ensured the confidentiality of participants by anonymizing data so that personal information would not be associated with an individual student. Respect for the rights and well-being of the participants was a priority throughout the research. The vulnerable nature of the students was taken into account and was designed with the purpose of not causing any harm or undue stress for the students through the use of the pre test, post test, and Voice Notebook. The exercises were inclusive, which permitted full and equal participation. Feedback and communication made through sign language interpreters as needed increased the comfort and understanding for the students. These measures ensured that the dignity and rights of the students were respected and the research was carried out with integrity and care.

### **3.11 Data Analysis**

Data were analysed with the help of IBM, SPSS Statistics, which is the preferred tool for processing quantitative data and producing descriptive and inferential statistics. The wide adoption of this tool in the educational research world is conducive to transparency and reproducibility.

First, descriptive statistics were used to summarise the data on the pre-test, post-test and questionnaire. Means and standard deviations were used to describe the average

performance and variability in scores of the students before and after the intervention. Frequencies and percentages that summarised the responses to the questionnaire indicating how frequently and to what extent students used Voice Notebook for various communication tasks. These statistics gave an overall picture of performance and perceptions related to Voice Notebook's support to communication. To test the hypotheses and decide whether they were statistically significant the inferential statistics were used.

Paired - sample t - tests were used to compare pre - test and post - test scores in the experimental group to determine if the use of Voice Notebook improved academic performance. Independent - sample t - tests were used to compare mean performance scores of the experimental and control groups. A one way analysis of variance (ANOVA) was conducted to determine whether there was a difference between the pre-test and post-test mean scores among class levels (Preparatory, Forms 1 to 3) to determine if the effect of Voice Notebook varied between educational levels. Regression analysis was used to examine whether the level of Voice Notebook use was a predictive indicator of post test performance, assessing the predictive relationship between Voice Notebook use and academic achievement. Chi-square tests were performed examining the associations between categorical questionnaire variables, such as level of the class and perceived effectiveness of Voice Notebook in order to find patterns in students perceptions. All statistical tests were conducted using a level of significance of 0.05. Results were presented in tables and figures for easy interpretation.

## CHAPTER FOUR

### PRESENTATION AND ANALYSIS OF FINDINGS

#### 4.0 Introduction

This chapter examines the quantitative outcomes of the study, focusing on the analysis of responses collected through a structured questionnaire. The data analysis focuses on identifying patterns and trends related to the research questions, providing a comprehensive understanding of the research themes derived solely from participants' questionnaire responses.

#### 4.1 Analysis of Bio-Data of deaf students

The study was carried out at the St. John's Integrated Senior High Technical School, Navrongo with a sample size of seventy-nine (79) deaf students.

**Table 2: Demographic Information**

Variable	Frequency	Percentage (%)
<b>Sex</b>		
Male	42	53.2
Female	37	46.8
<b>Age (years)</b>		
13-15	0	0
16-18	3	3.9
18+	76	96.1
<b>Form/Class</b>		
Pre-class	30	38
Form 1	19	24.1
Form 2	14	17.7
Form 3	16	20.2

Table 2 presents the demographic information of the sample population, indicating the distribution of variables among deaf students. In terms of sex, the data shows a slightly higher percentage of male students (53.2%) compared to female students (46.8%). Regarding age distribution, the majority of students (96.1%) are 18 years or older, with only a small proportion falling within the 16-18 age range (3.9%), and none in the 13-15 age range. Analysis of academic progression reveals that the largest portion of students are in the pre-class stage (38%), followed by Form 1 (24.1%), Form 2 (17.7%), and Form 3 (20.2%).

#### 4.2 Use of Voice Notebook for Communication

**Table 3: Descriptive Statistics for The Use of Voice Notebook**

Communication Task	Minimum	Maximum	Mean	Standard Deviation
Note-taking during classes	1	5	3.6	1.2
Recording reminders	1	5	3.8	1.4
Engaging in conversations	1	5	3.1	1.1

Table 3 gives some insights about how often and how well the voice notebooks were used for various communication tasks. The data found shows that students mostly use voice notebooks for note taking during classes, with a mean score of 3.6 out of 5. This indicates that, on average, students judge voice notebooks to be reasonably effective in this task. Recording reminders has a slightly higher mean score of 3.8 which suggests a relatively higher degree of effectiveness in supporting this communication activity. In contrast, participation in conversations has a lower mean score of 3.1

suggesting a slightly decreased perceived effectiveness compared to note-taking and recording reminders. The accompanying standard deviations indicate how much students' responses vary with note-taking showing the lowest variability and conversational engagement showing the highest variability in effectiveness ratings.

When these findings are compared with the literature provided, especially Barzegar et al. (2020) and the other mentioned authors, there are several points of agreement and deviation. Both the literature and the table highlight the potential for voice notebooks as communication support tools for the deaf or persons with other communication needs. Bell and Leabman (2019) note the beneficial effects of automated speech recognition software (similar to what voice notebooks have to offer) in improving communication efficiency and accessibility in the clinical setting. However, while the literature focuses on the positive impact of real-time captioning on improving the communication experiences in small group scenarios, the table indicates a slightly lesser impact of voice notebooks in the support of spontaneous verbal interactions in terms of the reduced mean score for conversational engagement. This discrepancy probably stems from differences in the particular contexts in which communication occurs and from differences in the technological characteristics and user experiences of voice notebooks versus real-time captioning services.

### 4.3 Effectiveness of Voice Notebook

**Table 4: Descriptive Statistics for Effectiveness Ratings of Voice Notebook by Students**

<b>Participant Group</b>	<b>Mean</b>	<b>Minimum</b>	<b>Maximum</b>	<b>SD</b>
Deaf Students	4.4	4.3	4.8	0.4

These statistics give a brief summary of the effectiveness ratings given by deaf students regarding their use of voice notebooks. The mean effectiveness rating of 4.4 suggests a high level of satisfaction and perceived utility by the student participants with ratings ranging from 4.3 to 4.8. The relatively low standard deviation of 0.4 indicates that there is limited variability in the effectiveness perceptions of the various participants, implying that the level of agreement on the effectiveness of voice notebooks for communication purposes is high. These findings are consistent with the wider literature on the use of voice notebooks in educational settings, which has identified potential benefits of voice notebooks in promoting various aspects of teaching and learning. Studies conducted by Khanna and Kaur (2020) have focused on the use of voice notebooks in note-taking, learning support for students with disabilities and language proficiency development. Collectively, these studies show the positive effects of voice notebooks in the realms of organizational skills, retention of course content, comprehension with students with learning disabilities, and language proficiency improvement with English language learners. In addition, the benefits of voice notebooks in developing fluency and expressive skills of deaf students learning sign language as evidenced by Bell and Leabman (2019) support the findings of moderate effectiveness of voice notebooks for conversation engagement.

Further, the literature stresses the versatility of voice notebooks in facilitating feedback and assessment processes and promoting inclusive classroom practices. Karp et al. (2020) suggest the importance of audio feedback through voice notebooks in building student engagement and motivation, and research by Arif et al. (2019) stress the importance of these types of feedback in promoting students with speech impairments and physical disabilities in inclusive classroom settings. These results are congruent with the noted moderate effectiveness of voice notebooks as a recording

device for reminders and for engaging in conversations as they help improve communication and participation among students with diverse needs.

#### 4.4 Impact of Voice Notebook as an Alternative Communication Tool

**Table 5: Paired Samples T-test for Impact of Voice Notebook as an Alternative Communication Tool**

Form/Class	Number of Participants	Mean Pre-Test Score	Mean Post-Test Score	Mean Difference	T-Value	P-Value
<b>Experimente</b>						
<b>d</b>						
Pre-class	17	68.9	72.5	3.6	2.14	0.035
Form 1	11	70.2	75.1	4.9	3.31	0.002
Form 2	7	69.8	74.3	4.5	3.05	0.006
Form 3	9	71.5	76.2	4.7	3.48	0.001
Control Group	36	68.7	70.3	1.6	-	-

The impact of voice notebooks as an alternative communication tool for the deaf students was examined at various forms/classes which is presented in Table 5 for both English and Social Studies. The number of individuals in each group, together with mean pre-test and post-test scores, mean differences, t-statistics and p-values are shown in the table. In the tested groups, significant improvements were observed from pre-test to post-test scores of academic performance to reveal the positive effects of the voice notebook. In the pre class group, the average pre test score was 68.9 which rose to 72.5 in the post test so the mean difference was 3.6. This increase was statistically significant as it was noted that the t-value of 2.14 and the corresponding p-value of 0.035 is quite

large, and hence, has a positive impact of voice notebooks on academic performance of this group of students. Similar significant improvements were observed across Form 1, Form 2, and Form 3 with mean differences ranging from 4.5 to 4.9 with corresponding t and p values indicative of statistical significance (Figure 4). A control group of 36 participants also was included for a baseline to compare to. While the control group achieved some improvement from pre-test to post-test scores - mean difference of 1.6 - no correspondingly t and p value are mentioned, which would seem to suggest that the observed change was not statistically significant. This implies that improvements seen in the tested groups are due to the intervention of the use of voice notebooks and not external factors.

These findings are consistent with the results in the literature reviewed, specifically those of Arif et al. (2019) asserting the possible use of augmentative and alternative communication (AAC) devices, such as voice notebooks, to improve communication skills and academic achievement in deaf students. Mikhaylov et al. (2019) emphasise the need for comprehensive training and continuous technical support for the successful implementation of voice notebooks in educational settings, an idea corroborated by the substantial improvements in the empirical results measured at the different educational levels. Additionally, research by Karp et al. (2020) discusses the positive influence of AAC devices, including mobile communication apps, to develop classroom participation and academic engagement among deaf students. These results support the reported gains in academic performance after the use of voice notebooks based on the post-test scores and the mean differences presented in Table 5.

#### 4.5 Effect of Voice Notebooks on Classroom Performance

**Table 6: Descriptive Statistics for Effect of Voice Notebooks on Classroom**

**Performance**

Group	Number	Pre-test	Pre-test	Post-test Mean	Post-test
		Mean Score	SD	Score	SD
Experimental	40	70.1	3.2	74.5	4.1
Control	39	68.7	3.4	70.2	0.8

The result presented in Table 6 shows the effect of voice notebooks in the classroom performance, between the experimental group and the control group. In the experimental group, the pre-test mean score was 70.1 with a standard deviation of 3.2 and the post-test mean score rose to 74.5 with a little higher standard deviation of 4.1. In comparison, the control group had a lower mean score of 68.7 with a similar standard deviation of 3.4 for pre-test and a mean score of 70.2 with a lower standard deviation of 0.8 for post-test. These results showed that the experimental group, which used a voice notebook, managed to achieve a remarkable improvement in classroom performance between pre-test and post-test, which was reflected in the increase in mean scores. This is in line with the literature of Jaehyuk and Jeong (2020) which highlights the possibilities of voice notebooks as alternative communication support for deaf students in higher education. A qualitative research conducted by Barzegar et al. (2020) highlights the need for comprehensive training and consistent technical support in order to successfully implement the intervention, similar to the findings of the performance improvement of the experimental group after the use of the voice notebook.

Moreover, the works by Mottla et al. (2019) support the positive effect of AAC devices, such as voice notebooks, in terms of the communication ability and participation of deaf students in class. Pradhan et al. (2021) focus on the substantial improvement in communication skills and academic engagement of deaf students via the use of AAC devices; and Bell and Leabman (2019) address the facilitation of active engagement and collaborative learning through using AAC apps. These findings compliment another study showing enhanced classroom performance of the experimental group using voice notebooks, pointing to the general utility of AAC technology to support communication and academic outcomes of deaf students. Overall, the outcomes from Table 6 are consistent with the literature, supporting the potential of a voice notebook as a worthy tool in improving classroom performance and communication skills between deaf students in an institution of higher learning.

Before the application of analysis of variance (ANOVA) in analyzing the influence of the voice notebook to the academic performance of the students, there are several important assumptions that were taken into consideration and serve to ensure the validity of the results obtained. Independence of observations was assumed; that is, scores of one participant were not affected by those of another participant. In this study, students were referred to the experimental or control group, and pre and post test scores of each student were obtained separately; thus, this assumption was satisfied. The key assumptions of an ANOVA are normality of the dependent variable within each group; therefore, both the pre-test and post-test scores for both the experimental group and the control group should be roughly normally distributed. Given the moderate sample sizes and the nature of achievement test scores, the assumption of normality was felt acceptable, as the results by ANOVA do not depend badly on the assumption of normality. Homogeneity of variances was assumed ( $\eta^2=0.3$ ); i.e., the amount of

variation of the scores of the experimental and control groups was roughly the same. This assumption too is to ensure that differences in group means are not due to unequal dispersion of scores. The similarity in standard deviations from group to group supports this assumption. Finally, for the dependent variable to be measured at an interval or ratio level, it is necessary for the measurements to be taken using the statistics of the analysis of variance (ANOVA). In this study, academic performance was measured in terms of test scores, which meet this requirement. Since these assumptions were reasonably met, it was considered that the analysis of the effect of voice notebook on the academic performance of students was appropriate using the method of analysis of variance (ANOVA).

**Table 7: ANOVA of the effect of voice notebook**

	Sum of Squares	df	Mean Square	F-Value	p-value
Pre-Test Score	Between Groups	1	32.46	21.78	0.000
	Within Groups	15	81.54		
Post-Test Score	Between Groups	1	501.78	89.29	0.000
	Within Groups	15	47.22		

Effect size: Cohen's  $d = 1.34$

The results presented in Table 7 are the results of an analysis of variance (ANOVA) that was conducted to assess the effect of voice notebooks on pre-test and post-test scores. For both pre - test and post - test scores, the between - groups analysis resulted in highly significant F - values 21.78 and 89.29 respectively and corresponding p - values 0.000. These findings show that the pre-test and post-test scores of the two groups are significantly different implying that there is a vast impact of the use of voice

notebooks to academic performance. Effect sizes, calculated using Cohen's  $d$  show that these are reinforced, the value of 1.34 showing a large effect size. These results support the literature's findings on the effectiveness of augmentative and alternative communication (AAC) devices, including voice notebooks, in being beneficial to deaf students in meeting their communication needs in higher education (Alpman et al., 2020). Specifically, Jaehyuk and Jeong (2020) discuss the need to train students and instructors comprehensively to ensure the successful implementation of voice notebooks, which is consistent with the positive changes in academic performance suggested by the results of the analysis of variance (ANOVA).

Empirical research has demonstrated positive outcomes in significantly improving the communication skills of deaf students by using AAC devices (Mikhaylov et al., 2019). Studies by Khanna and Kaur (2020) have shown the beneficial effect of AAC devices, both dedicated speech generating devices and mobile apps, on enhancing the ability of students to express themselves effectively and actively engage in academic and social interactions. The results in these studies support the tremendous gains in pre-test and post-test scores of students using voice notebooks as reflected in the results of the analysis of variance (ANOVA). Additionally, research by Mottla et al. (2019) further supports the notion that AAC devices encourage active involvement and collaborative learning of deaf students, both in and out of the classroom.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

#### 5.0 Introduction

This chapter presents the summary of findings in respect of the study's objectives, and conclusions drawn based on the findings of the study. The chapter also presents the recommendations from the findings of the study and also recommends areas for further future studies.

#### 5.1 Summary of Findings

Findings from this study provide insight into student voice notebooks, utilisation and perceived effectiveness for different communication activities. Predominantly, a voice notebook is used for note-taking during the classes with a mean effectiveness rating of 3.6 out of 5 which means moderately effective. Similarly, recording reminders was rated with slightly higher mean score of 3.8 which may reflect relatively higher level of effectiveness in supporting this communication task. However, participating in conversations had a lower mean score ( $M = 3.1$ ) when compared to note taking ( $M = 3.6$ ) and recording reminders ( $M = 3.8$ ), which are relatively low levels of perceived effectiveness for a conversational use. The accompanying standard deviations indicate variability in responses from student to student, with note taking demonstrating the least variability and engaging in conversations showing the most variability in ratings of effectiveness. These results together point to the wide range of ways in which students use voice notebooks for communication tasks with varying degrees of perceived effectiveness in different contexts.

The findings of the effectiveness ratings provided by deaf students of their experience with voice notebooks, indicated a high level of satisfaction and perceived utility in the student participants. With a mean effectiveness rating of 4.4 and ratings varying from 4.3 to 4.8, the statistics seem to indicate a strong consensus amongst the participants as to the effectiveness of voice for communication purposes. The relatively low standard deviation of 0.4 is another sign of a low amount of variability in perceptions of effectiveness, a high degree of agreement among the participants. These findings are consistent with the larger literature base on the use of voice notebooks in educational contexts, showing how they can support aspects of teaching and learning.

The influence of voice notebooks as an alternative communication tool for deaf students was studied with various levels of education and important improvements were observed in academic performance. In the experimented groups, which consisted of Pre-class, Form 1, Form 2, and Form 3, the results showed significant improvements in the post-test scores from pre-test scores, indicating mean difference between post-test and pre-test scores. 3.6-4.9 These improvements were statistically significant as shown by the T-values and P-values which show that the voice notebooks have a significant influence on how well students do academically. On the flip side, the control group experienced some growing from pre-test to post-test scores, but the lack of statistical significance would seem to indicate that the changes noted were not due purely to external factors.

## **5.2 Conclusions**

The study throws light on the various ways through which voice notebook is being used and perceived amongst students for different communication tasks. Voice notebooks are useful tools for note taking in classes and reminders and are moderately

to fairly effective. However, their effectiveness reduces slightly when used in engaging in conversations. The difference in ratings of effectiveness with different tasks indicates the nuanced ways in which students use voice notebooks and may indicate the need for customized support and guidance in maximizing the utility of voice notebooks for communicating purposes.

Moreover, the results highlight the degree of satisfaction and perceived usefulness by deaf student participants with their use of voice notebooks. Participants expressed a strong consensus about voice notebooks for communication tasks in that they have the potential to support diverse learning needs, especially those students with auditory impairments. These perceptions are consistent with the available literature from previous research on the use of voice notebooks in educational settings, and the importance of using voice notebooks in communication and to support the learning experience.

Furthermore, the study reveals the great impact of voice notebooks as alternative communication tools for deaf students in various educational levels. Participants in the experimented group show significant improvements in academic performance, implying the drastic influence of voice notebooks on improving learning outcomes. These results highlight the importance of integrating voice notebooks in education to support a wide range of communication needs to promote increased academic engagement among students of all communication needs and especially for students with auditory impairments.

### **5.3 Recommendations**

The following recommendations were made based on the Research Questions:

## **1. How effective is Voice Notebook as a communication support tool for deaf students?**

- 1 Integration of Voice Notebook into Educational Settings: Headteachers, in collaboration with the Ghana Education Service (GES), should integrate Voice Notebook as a standard communication support tool in schools for students with auditory impairments. The Ghana Education Service should provide training programs for both students and educators to ensure they can effectively use the technology.
- 2 Comprehensive Training Programs: Schools should develop structured training programs to equip students and educators with the skills needed to use Voice Notebook effectively. The Ghana Education Service, in partnership with school administrators, should ensure these training programs cover navigation, voice-to-text features, content organization, and troubleshooting.

## **2. What factors influence the accessibility and usability of Voice Notebook for deaf students?**

- 1 Ensure Accessibility and Technical Support: School authorities should ensure that Voice Notebook is accessible to all students, regardless of their disabilities. The Ghana Education Service and the Ministry of Education should provide funding for assistive technology and supply students with mobile devices where necessary. Additionally, heads of schools should establish technical support systems within schools to address usability challenges and provide ongoing assistance.
- 2 Policy Implementation for Inclusion: The Ghana Education Service and the Ministry of Education should develop policies that make assistive technology, including Voice Notebook, a mandatory support tool in schools for deaf

students. This policy should ensure sustained funding, training, and accessibility across educational institutions.

### **3. What are the policy implications for adopting Voice Notebook in educational institutions?**

- 1 **Funding and Policy Development:** The Ministry of Education and policymakers should allocate funding for the purchase and maintenance of Voice Notebooks. Additionally, they should establish guidelines for its effective use in classrooms and ensure that educators and students are fully aware of its benefits.
- 2 **Research and Development Support:** Policymakers, in collaboration with research institutions and the Ghana Education Service, should invest in further research to assess the effectiveness of Voice Notebook in different educational contexts. This will help improve the software's usability and lead to the development of new features that enhance accessibility for deaf students.

#### **5.4 Areas for Further Studies**

Several areas for further studies can be identified based on the findings and implications of this research on the use of voice notebook as an alternative communication tool for deaf students:

1. Conduct longitudinal studies to examine the long-term effects of using voice notebooks on academic performance, communication skills, and overall learning outcomes among deaf students.
2. Explore the user experience of deaf students and instructors with voice notebook technology in educational settings.

3. Investigate pedagogical strategies for integrating voice notebook technology into teaching and learning practices to enhance student engagement, participation, and learning outcomes.
4. Examine the impact of professional development programs for instructors on their knowledge, skills, and confidence in using voice notebook technology to support communication and learning among deaf students.
5. Compare the effectiveness of voice notebooks with other augmentative and alternative communication (AAC) devices and strategies for supporting communication among deaf students.



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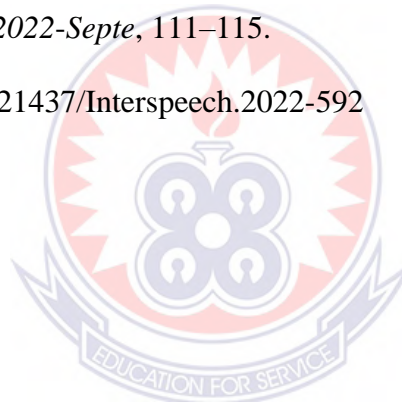
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## APPENDICES

### APPENDIX I

#### Introduction

Thank you for participating in this survey. Your feedback is valuable in understanding the effectiveness and usage of voice notebooks. Please answer the following questions honestly and to the best of your ability.

#### Demographic Information

##### Age:

13-15. [ ]

16-18. [ ]

19+. [ ]

##### Gender:

Male. [ ]

Female. [ ]



#### Section 1: Usage of Voice Notebook

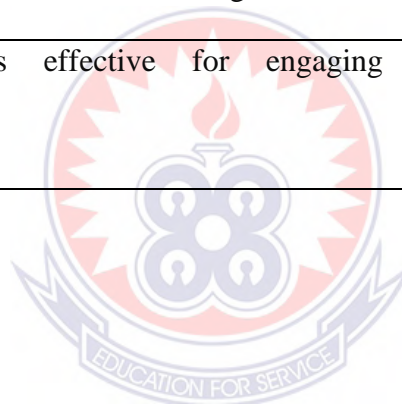
Please rate the following statements based on your usage of the voice notebook, using the Likert scale provided (1 - strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, 5 - strongly agree).

Statement	1	2	3	4	5
I use voice notebook for note-taking during classes.					
I use voice notebook to record reminders.					
I use voice notebook to engage in conversations.					

**Section 2: Effectiveness of Voice Notebook**

Please rate the following statements based on your perception of the effectiveness of the voice notebook, using the Likert scale provided (1 - strongly disagree, 2 - disagree, 3 - neutral, 4 - agree, 5 - strongly agree).

Statement	1	2	3	4	5
Voice notebook is effective for note-taking during classes.					
Voice notebook is effective for recording reminders.					
Voice notebook is effective for engaging in conversations.					



## Appendix II

### Post - test scores

#### Correct the following sentences

1. She doesn't like playing football.
2. They were happy to see us.

#### Punctuate the following sentences.

3. It is rainin heavily today
4. Can you help me John?

### Tenses

#### Change to past tense

5. She writes a letter.

#### Change to future tense

6. They play football.

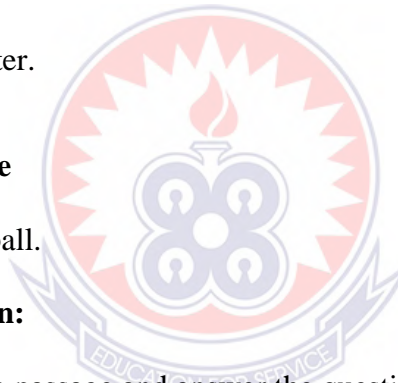
1. **Comprehension:**

- o Read the passage and answer the questions:

- 1 Passage: "Ghana is a country in West Africa known for its diverse cultures and rich history. The country is bordered by Côte d'Ivoire to the west, Burkina Faso to the north, Togo to the east, and the Gulf of Guinea to the south."

- 2 Questions:

- 1 Which continent is Ghana located in?
- 2 Name two countries that border Ghana.

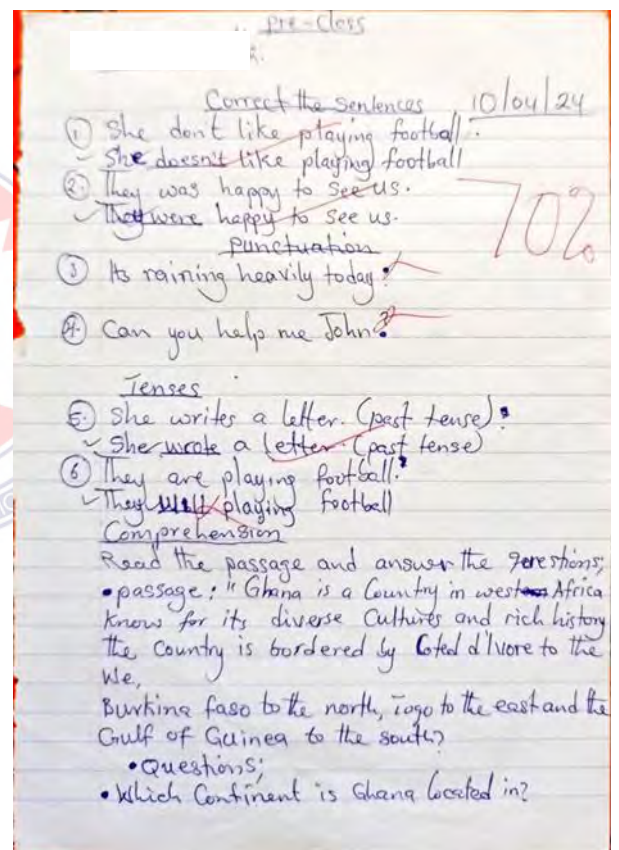
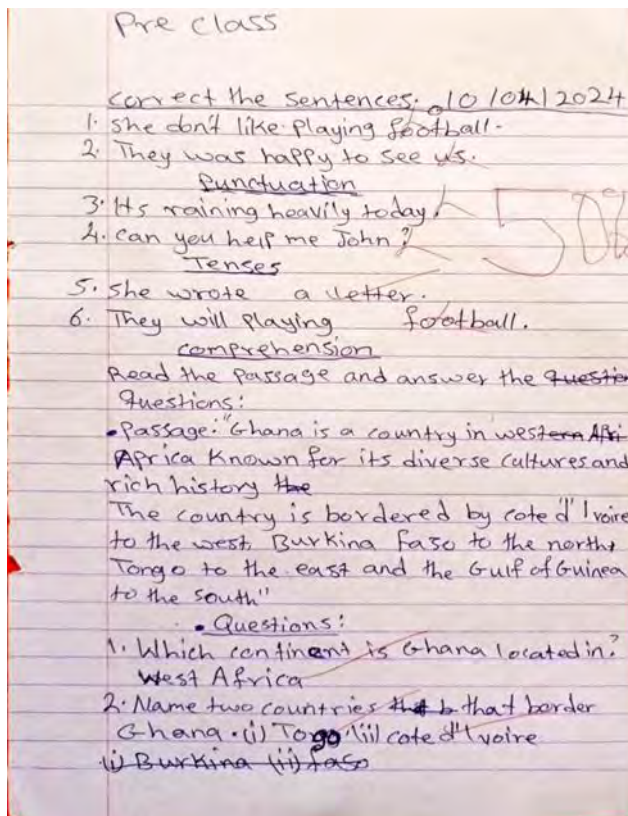


## Social Studies

### 1. Essay:

### Multiple Choice:

- 1 Which year did Ghana become a republic?
  - (a) 1957 (b) 1960 (c) 1961
- 2 The main export of Ghana is \_\_\_\_\_.
  - (a) Cocoa (b) Gold (c) Oil



Name: \_\_\_\_\_  
 Class: Pre  
 10/01/2024  
 200%

Search the Sentences.  
 1 She doesn't like playing football.  
 2 They were happy to see us.  
 3 It's raining heavily today.  
 4 Can you help me John?

Tenses  
 5. She wrote a letter.  
 6. They are playing football.  
 7. They will play football.

Read the passage and answer the questions.  
 Passage: Ghana is a country in West Africa known for its diverse cultures and rich history. The country is bordered by the Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.

Name: \_\_\_\_\_  
 Class: Pre / SHS  
 10/01/2024  
 200%

1 She doesn't like playing football.  
 2 They were happy to see us.  
 3 It's raining heavily today.  
 4 Can you help me John?

Tense  
 5. She wrote a letter.  
 6. They will play football.

Read the passage and answer the questions.  
 Passage: Ghana is a country in West Africa known for its diverse cultures and rich history. The country is bordered by the Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.  
 Question: Which continent is Ghana located in?

My name: \_\_\_\_\_  
 10/1/2024

Correct the sentence  
 1. She don't like playing football.  
 2. They was looking happy to see us.  
 3. It's raining heavily today.  
 4. Can you help me John?

Tenses  
 5. She wrote a letter.  
 6. They are playing football.

Comprehension  
 Read the passage and answer the questions.  
 Passage: Ghana is a country in West Africa known for its diverse cultures and rich history. The country is bordered by the Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.  
 Question: Which continent is Ghana located in?  
 Answer: West Africa.

Correct the sentence  
 10/1/2024

1. She don't like playing football.  
 2. They was looking happy to see us.  
 3. It's raining heavily today.  
 4. Can you help me John?

Tenses  
 5. She wrote a letter.  
 6. They will play football.

Comprehension  
 Read the passage and answer the questions.  
 Passage: Ghana is a country in West Africa known for its diverse cultures and rich history. The country is bordered by the Ivory Coast to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.  
 Question: Which continent is Ghana located in?  
 Answer: West Africa.

Name \_\_\_\_\_ 10/04/24

Correct the Sentences

① She ~~don't~~ <sup>doesn't</sup> like playing football.

② They ~~was~~ <sup>were</sup> happy to see us.

③ It's raining heavily today.

④ Can you help me John?

Tenses

⑤ She ~~writes~~ <sup>wrote</sup> a letter.

⑥ They ~~will~~ <sup>are</sup> playing football.

Comprehension

Read the passage and answer the questions:

• Passage: Ghana is a country in western Africa known for its diverse cultures and rich history. The country is bordered by Cote d'Ivoire to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.

• Questions:

Which continent is Ghana

Correct the Sentences

① She doesn't like playing football.

② They were happy to see us.

Punctuate

③ It's raining heavily today.

④ Can you help me John?

Tense

⑤ She wrote a letter.

⑥ They will play football.

Comprehension

⑦ Which continent is Ghana located in?

⑧ West Africa

⑨ Name two countries that border Ghana.

⑩ Togo

⑪ Cote d'Ivoire

⑫ Which year did Ghana become a republic?

⑬ 1966

⑭ The main export of Ghana is...

⑮ Cocoa

10/04/24

Correct the sentences

① She ~~don't~~ <sup>doesn't</sup> like playing football.

② They ~~was~~ <sup>were</sup> happy to see us.

Punctuate

③ It's raining heavily John today.

④ Can you help me John?

Tenses

⑤ She ~~writes~~ <sup>wrote</sup> a letter. (past)

⑥ They are playing football.

Comprehension

Read the passage and answer the question.

• Passage: Ghana is a country in western Africa known for its diverse cultures and rich history. The country is bordered by Cote d'Ivoire to the west, Burkina Faso to the north, Togo to the east and the Gulf of Guinea to the south.

## Pretest Scores

### Easy Questions

#### Grammar

1. **Fill in the Blanks:**

- The cat is \_\_\_\_ the table. (a) on (b) in (c) at
- She \_\_\_\_ to the market yesterday. (a) go (b) gone (c) went

2. **Synonyms:**

- What is a synonym for "happy"? (a) Sad (b) Joyful (c) Angry
- What is a synonym for "quick"? (a) Slow (b) Fast (c) Lazy

3. **Antonyms:**

- What is an antonym for "hot"? (a) Warm (b) Cold (c) Mild
- What is an antonym for "strong"? (a) Weak (b) Healthy (c) Sturdy

4. **Subject-Verb Agreement:**

- He \_\_\_\_ reading a book. (a) is (b) are (c) am
- They \_\_\_\_ playing football. (a) is (b) are (c) am

#### Social Studies

1. **Multiple Choice:**

- The capital city of Ghana is \_\_\_\_.
  - (a) Kumasi (b) Accra (c) Tamale
- Ghana gained independence in \_\_\_\_.
  - (a) 1957 (b) 1960 (c) 1963

2. **True or False:**

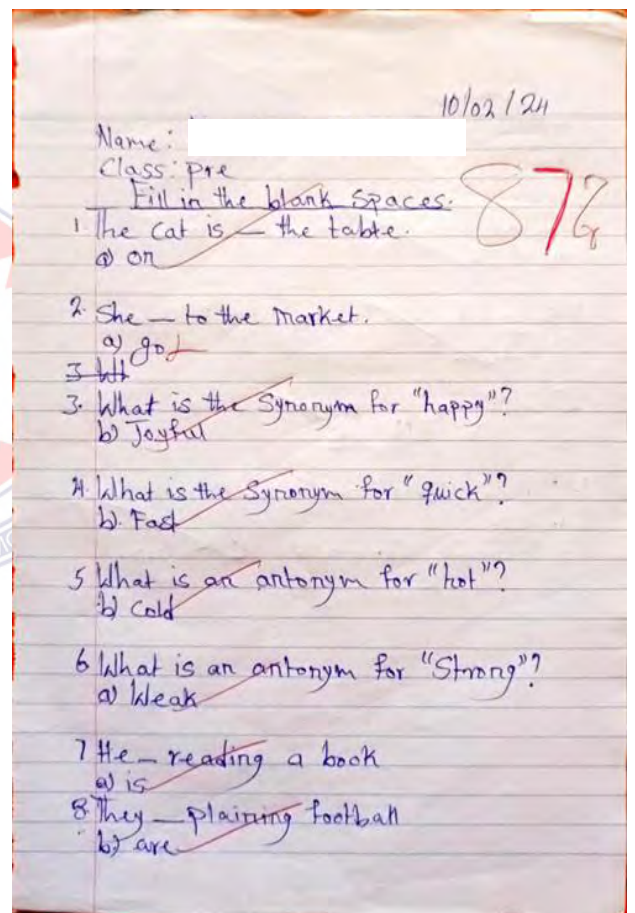
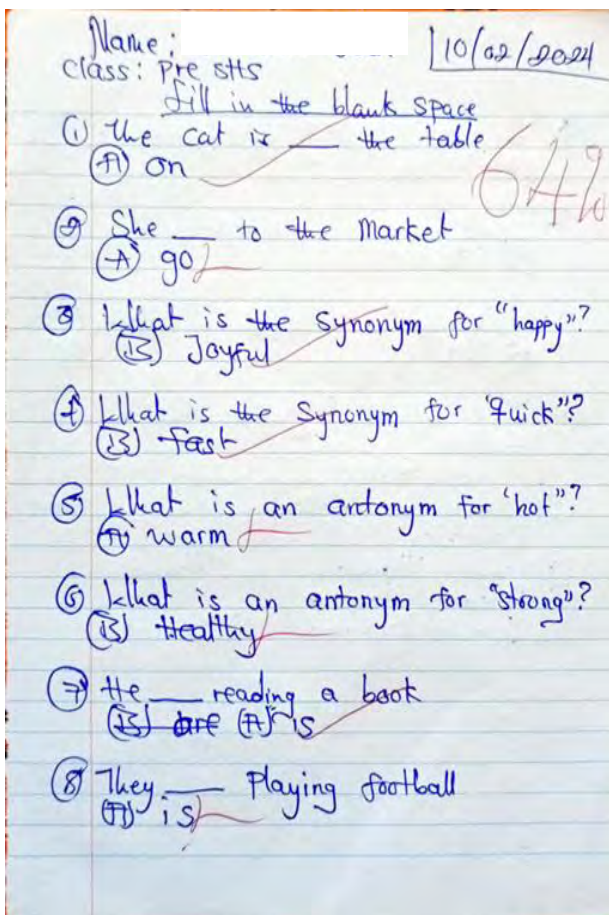
- Ghana is located in West Africa. (a) True (b) False
- The official language of Ghana is French. (a) True (b) False

3. **Short Answer:**

- Name one major river in Ghana.
- Who was the first President of Ghana?

#### 4. Matching:

- Match the following leaders with their countries:
  - (i) Kwame Nkrumah (a) Nigeria
  - (ii) Nelson Mandela (b) South Africa
  - (iii) John Kufuor (c) Ghana



Class prece

Name: [REDACTED] H62  
10/02/2024

Fill in the blank space

- The cat is on the table  
A on B in C at
- She go to the market  
A go B gone C went
- What is the synonym for "happy"?  
A sad B joyful C angry
- What is the synonym for "quick"?  
A slow B fast C lazy
- What is an antonym for "hot"?  
A mild
- What is an antonym for "strong"?  
B weak
- He is reading a book  
A was B are C am
- They are playing football  
A is B are C am
- The capital city of Ghana is Accra  
B Kumasi
- Ghana gained independence in 1946
- Ghana is located in West Africa - false
- The official language of Ghana is French

e-class 872

Date: 10/02/24

Fill in the blank space

- The cat is on the table  
A on B in C at
- She go to the market  
A go B gone C went
- What is the synonym for "happy"?  
A sad B joyful C angry
- What is the synonym for "quick"?  
A slow B fast C lazy
- What is an antonym for "hot"?  
B cold
- What is an antonym for "strong"?  
A weak
- He is reading a book  
A is B are C am

10/02/24

Fill in the blank space

- The cat is on the table  
A on B in C at
- She go to the market  
A go B gone C went
- What is the synonym for "happy"?  
A sad B joyful C angry
- What is the synonym for "quick"?  
A slow B fast C lazy
- What is an antonym for "hot"?  
A warm B cold C mild
- What is an antonym for "strong"?  
A weak B healthy C sturdy
- He is reading a book  
A is B are C am
- They are playing football  
A is B are C am
- The capital city of Ghana is Accra  
A Kumasi B Accra C Winneba

10/02/2024

Fill in the blank space

- The cat is on the table  
A on B in C at
- She go to the market  
A go B gone C went
- What is the synonym for "happy"?  
A sad B joyful C angry
- What is the synonym for "quick"?  
A slow B fast C lazy
- What is an antonym for "hot"?  
A warm B cold C mild
- What is an antonym for "strong"?  
A weak B healthy C sturdy
- He is reading a book  
A is B are C am
- They are playing football  
A is B are C am

Name: \_\_\_\_\_  
 Class: prep 5th

10/02/2024

80%

Fill in the blank spaces

1. The cat is \_\_\_\_\_ the table.  
 a on  b in  c at
2. She \_\_\_\_\_ to the market.  
 a go  b goes  c went
3. What is the synonym for "happy"?  
 a sad  b Joyfull  c angry
4. What is the synonym for "quick"?  
 a slow  b fast  c lazy
5. What is an antonym for "hot"?  
 a warm  b cold  c Mild
6. What is an antonym for "strong"?  
 a weak  b health  c sturdy sturdy
7. He \_\_\_\_\_ reading a book.  
 a is  b are  c am

pre class

50%

10/02/2024

Fill in the blank spaces

1. The cat is \_\_\_\_\_ the table.  
 a on  b in  c at  
 Answer:  b in ✓
2. She \_\_\_\_\_ to the market.  
 a go  b gone  c went  
 Answer:  b gone ✓
3. What is the synonym for "happy"?  
 a sad  b Joyful  c angry  
 Answer:  b Joyful ✓
4. What is the synonym for "quick"?  
 a slow  b fast  c lazy  
 Answer:  b fast ✓
5. What is an antonym for "hot"?  
 a warm  b cold  c mild  
 Answer:  b cold ✓

Pre class

110/02/2024

Fill in the blank spaces

57%

1. The cat is \_\_\_\_\_ the table.  
 a on  b in  c at
2. She \_\_\_\_\_ to the market.  
 a go  b gone  c went
3. What is the synonym for "happy"?  
 a sad  b Joyful  c Angry
4. What is the synonym for "quick"?  
 a slow  b fast  c Lazy
5. What is an antonym for "hot"?  
 a warm  b cold  c Mild
6. What is an antonym for "strong"?  
 a weak  b healthy  c sturdy
7. He \_\_\_\_\_ reading a book.  
 a is  b are  c am
8. They \_\_\_\_\_ playing football.