MULTIMODAL INTERVENTION SYSTEM FOR DEVELOPING SIGHT WORDS AMONG CHILDREN WITH HEARING IMPAIRMENT

Submitted by

Arthana Udayanand

(Reg. No. 20PSE006)

Under the Guidance of

Dr.G.Victoria Naomi

A Thesis submitted to

Avinashilingam Institute for Home Science and Higher Education for Women, Coimbatore - 641043

In Partial Fulfillment of the Requirement for the Degree of

Master of Education in Special Education

(Hearing Impairment)

(MAY - 2022)

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Certified as a Bonafide Research work

Signature of the Head of the Department	Signature of the Dean of the Faculty	Signature of the Guide

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CHAPTER I
INTRODUCTION

1.0.0 Introduction

"Deafness is a sensory difference. It only becomes a disability when the educational system fails the child and family"

- Dr. Christine Yoshinaga- Itano

Students with Hearing Impairment are the most disadvantaged group in the field of education since they are denied access to various resources as well as quality education. The problems faced by these children in a classroom are often left unnoticed by their teachers and thereby it becomes a tough task for the students to cope up with their studies. In the light of this issue, the present study entitled "**Multimodal Intervention System for Developing Sight Words among Students with Hearing Impairment**" is related to developing Multimodal Intervention Strategies for learning of sight words among students with hearing impairment. This study is intended to impact instruction in learning English which is currently a huge barrier to these students in an inclusive classroom.

English has become an alien language to students with Hearing Impairment in India since learning a foreign language along with their mother tongue is found to be a strenuous task. Multimodal Intervention means teaching concepts using multiple modes. The techniques adopted as Multimodal Intervention in this study include videos of teaching sight words through FAASST US method.

Fingerspelling-F
Arm Tapping-A
Air Writing-A
See and Say-S
Sign Language-S
Table Writing-T
Usage of words in a sentence-US

In this chapter, the details in respect to Concept and Definition of Hearing Impairment, Multimodal Intervention System, Types of Multimodal Learning, Education for Students with Hearing Impairment, Teaching Sight words to Students with Hearing Impairment, Rationale of the Study, Statement of the Problem, Objectives, Hypothesis and Delimitation have been given in separate captions.

This study was experimental in nature where in Multimodal Intervention system was used to test sight words acquisition among Students with Hearing Impairment. To look into the variations in the results, students from Special and Inclusive schools were taken as samples.

1.1.0 Background of the Study

Education illuminates a person's mind and thinking, it helps people think, feel, and behave in an appropriate way that contributes to their success, and improves their personal satisfaction. Education develops human personality, thoughts, dealing with others and prepares people for life experiences.

Hearing impairment (HI) is considered a hidden disability because it is not visible unlike other types of disabilities such as Visual Impairment or Physical impairment which are clearly identifiable. HI or deafness according to (IDEA, 2004) is a condition where an individual is impaired in processing linguistic information through hearing. Children constitute 39 percent of the country's population, and there are more than 7.8 million children with disabilities. One in 250 children in India, and globally, some 32 million children suffer from severe to profound hearing loss (**National Sample Survey Organization, NSSO, 2011**).

Quality Education to children with hearing impairment is still a doubt full question. In this 21st century, when everybody are enjoying freedom and getting access to quality education online effortlessly, there arises the need to focus on equity for children with hearing impairment which has been brought out through this study.

1.2.0 Concept of Hearing Impairment

Hearing is one of the five senses, and allows one to perceive sound. When the hearing ability is lost totally or partially, it is called Hearing Impairment, Hearing Loss, or Hard of Hearing. According to **Varshney S., (2016)**, Hearing Impairment

cannot be seen and hence its effects are not visible to others, so deaf suffers in silence. Hearing Impairment leads to a great social and educational impact because a person lives by communication with the world around him or her.

Categorization of Hearing Impairment

i. Based on the site of leison:

1. **Conductive Hearing Loss-** Conductive hearing loss can be caused by blockage of the external canal, perforation of the eardrum, infections and diseases of the middle ear, and disruption or fixation of the small hearing bones. A person with a conductive hearing loss may hear better in noise than in quiet and generally hears well over the telephone.
2. **Sensory-neural Hearing Loss-**Sensory-neural hearing impairment is more common and has many possible causes. Usually the condition results in slow, gradual loss of the sound receptors and nerve endings. Patients may experience a lack of sensitivity to sound or a lack of interpretation or clarity of sound. Speech understanding is difficult when there is background noise, and hearing sensitivity is usually better for low tones than high-pitched sounds.
3. **Mixed Hearing Loss-** Mixed hearing loss is a combination of conductive and sensory-neural hearing loss. There may be a problem in the outer or middle ear and in the inner ear or auditory nerve.**Auditory Neuropathy Spectrum Disorder-** Hearing loss that occurs when sound enters the ear normally, but because of damage to the inner ear or the hearing nerve, sound isn't organized in a way that the brain can understand.

ii. Based on the degree of the hearing loss:

Degree of hearing loss is measured in decibels. It is the loudness of a sound. According to Olusanya. O. B., Davis. C. A., Hoffman. J. H., (2019);

1. **Normal**-10 to 20dB -Hardly has any impact on communication In noisy environments, soft sounds are difficult to understand.
2. **Mild** -20 to 35dB-Even in quiet environments, distant speech is challenging to hear
3. **Moderate**- 36 to 50dB - Conversational speech can be heard only from nearby distance. Group activities are challenging.

4. **Moderately Severe**- 50 to 65dB - Clear conversational speech can be heard only when it is loud and speech is evidently impaired
5. **Severe**- 65 to 80dB - Cannot recognize many of the words in the conversational speech even when loud. Speech is not intelligible
6. **Profound**-80 to 95dB - Only hear very loud sounds and primary mode of communication would be through non-verbal mode
7. **Complete or Total hearing loss**- 95 dB + - Cannot hear any speech or sound

iii. Based on the number of ear affected:

1. Unilateral -Hearing loss is in one ear.
2. Bilateral- Hearing loss is in both ears.

iv. Based on the language acquisition:

1. Pre-lingual- Hearing loss happened before a person learned to talk.
2. Post-lingual- Hearing loss happened after a person learned to talk.

v. Based on the symmetry:

1. Symmetrical- Hearing loss is the same in both ears.
2. Asymmetrical- Hearing loss is different in each ear.

vi. Based on the progression and onset:

1. **Progressive or Sudden**- Hearing loss worsens over time (progressive) or happens quickly (sudden).
2. **Fluctuating or Stable**- Hearing loss gets either better or worse over time (fluctuating) or stays the same over time (stable).
3. **Congenital or Acquired/Delayed Onset**- Hearing loss is present at birth (congenital) or appears sometime later in life (acquired or delayed onset).

vii. Based on the Causes of hearing loss:

1. **Malingering of hearing loss**-Individuals may complain of ear pain, hyperacusis and tinnitus. Claims of hearing loss can sometimes result in larger monetary settlements from insurance companies or in the proceedings of litigation. Hearing professionals are generally very good at detecting malingering.

2. **Noise**-Loud noises frequently result in temporary hearing loss. Long-term exposure to loud noises causes permanent loss of sound receptors and damage to nerve endings.
3. **Aging**-Through normal aging, most individuals lose some of their sound receptors or nerve endings. Individuals vary widely in how age-related changes affect their hearing.
4. **Genetics**-Genetic factors can play a role in how inner ear structures develop and stay healthy. Inherited factors contribute not only to hearing loss in infants but also greatly influence the development of hearing loss later in life.
5. **Infections**-Viral infections can cause hearing loss in infants and adults, usually resulting in a sudden loss.
6. **Autoimmune attacks**- Sometimes, the body's own immune system will treat the inner ear as foreign tissue and attack it as an invader, resulting in hearing loss.
7. **Chemicals**- Chemical disturbances, through medications or metabolic changes, can affect the makeup of inner ear fluid or change its pressure or volume.

Early Identification and Intervention with appropriate education can bring out the potentials in children with hearing loss and with the invention of advanced technology.

1.3.0 Importance of Language for Children with Hearing Impairment

Language is a medium of communication between any individual. It helps in descriptions of instruction. Language is a powerful interactive tool in a classroom useful to both teacher as well as the students in teaching and learning.English by non-native speakers in a country in which English is the mother tongue, it would be a easy task to learn that language due to environmental infuence. English is the language of all fields- medical, engineering, computers, diplomacy, science& technology and aviation. Knowing English increases your chances of getting many opportunities for job. It is also the language of international communication, the media and the internet, so learning English is important for socializing and education. The ability to speak and write English properly allows people to advance in the professional world. Being able to speak in English also widens one's horizon in communicating globally. The

aim of Teaching Students with Hearing Impairments is to provide them resources and to equip them to meet the wide range of needs. Some of the methods used in teaching sight words to Students with Hearing Impairment in inclusive classes include FAASSTUS.

Teachers and students use spoken and written language to communicate with each other to engage in teaching learning processes, present academic content, assess learning, display knowledge and skill, and build classroom life. In their early years, children are learning both spoken and written language.

Educational programs for young children often emphasize curriculum and instruction to facilitate language learning. The alternative argument is that children are inherently wired as language learners and that providing them with a stimulating, rich language environment supplies them with the tools they need for further developing their spoken and written language abilities. Although teachers may provide instruction, the instruction should follow the student needs and interests rather than being prescribed in a predetermined manner.

1.4.0 Teaching Sight Words to Students with Hearing Impairment

The easy access to computers and Internet for everyone and the increasing number of web-based English courses has made a lot of people to study English online. Learning English online allows you to study English at your own pace at your own time. Children can choose the most convenient time and place to learn English lessons depending on your aptitude and availability without any pressure. It is highly flexible for Students with Hearing Impairment. Learning English online exposes individuals to different English concepts especially various sight words components. Online learning also helps Students with Hearing Impairment to develop knowledge and skills on English and technology. Interactive lessons through online allows Students with Hearing Impairment to learn sight words effectively.

According to WHO (2012), there are 120 million people worldwide with hearing impairment, and 78 million of those affected are in developing countries. In Sub Saharan Africa more than 1.2 million children aged between 5 and 14 years suffer from moderate to severe hearing loss in both ears and is considered to be mainly due to ear infections, lack of hygiene and lack of treatment (SAHI, 2011). In

Kenya, the KNBS(2010) census, Hearing impairment is related to health and substantially affects child's ability to normally acquire the speech. It has an influence on life of a child, earlier the problem is identified, health issues can be reduced accordingly. It is a fact that hearing loss is critical to language development and affects academic performance. Teaching Sight words to students with hearing impairment would help to overcome their insecurities as well as incapabilities.

1.5.0 Rationale of the Study

English Language proficiency is important in the present Education system. Children with hearing loss have difficulty with all areas of academic achievement, especially reading and mathematical concepts**(Kapoor, P (2019).** English language is an international language which is widely used all over the world for those who speak other languages. As a language of education and career, it should be accessible to everyone in the word even marginalised. **(Ms. Nisha M V ,Dr. J. Chriso Ricky Gill, 2020)**.

Previous studies found that development of language proficiency in multimodal ways create equal opportunities for all learners including those with disabilities. Research conducted by Saadiah Kummin, Shahlan Surat, FaridahMydinKutty, Zarina Othman, Nazri Muslim (2020) indicates that multimodal materials will not only enhance students' English language competency but also their analytical and creative thinking skills. One of the major characteristics of the deaf as well as hard of hearing children are that they often have delayed language and speech development which ultimately affects their verbal communication skills. Children with hearing impairment frequently use gestures and sign while communicating with others. Children with Hearing Impairment display abnormal rhythm in speech with nasal sounds, mispronunciation and monotonous voice. Their speech is unintelligible. In written language, hearing impaired children often find problems associated with sentence construction, gender, tense, appropriate uses of verbs, adjectives, nouns, idioms, etc. All these affect academic growth of hearing impaired students. Both reading and arithmetic performances are deficient in these children. **(Arya. A., 2016).** Deaf and Hard-Of Hearing(DHH) students from non-English-speaking countries, like their hearing peers, often have to learn English as a foreign language in order to communicate in the field of education, work, and entertainment and to reach their true

potential. As the major challenge of deafness is language fluency, and DHH persons often have problems using their national spoken/written languages, foreign language learning creates a new challenge for both deaf students and their teachers **(Domagała-Zyśk, E. 2015)**. Students with hearing impaired lag behind in academic achievement as compared to their counter parts with Hearing Impairment. The problems they face take a more severe form when these students with hearing impairment join higher classes **(Lindsay 2007).** Severe hearing impairment students' often show delayed in vocabulary comprehension in the spoken language **(Burger & Hoefnagel 2005)**. Due to the role language and literature play in the construction of social, economic and cultural systems, reading comprehension has become a growing challenge. Analysis indicated that comprehension and construction of meaning were generated by sharing life experiences and through the interaction produced in each one of the Sight Word Strategy stages. The study suggested further research into a more encompassing definition of reading comprehension and life experiences correlation as an appropriate goal for English as a foreign language **(Aaron, P. G., Joshi, R. M., Ayotollah, M., Ellsberry, A., Henderson, J., & Lindsey, K. 1999).**This study investigated whether an intervention using words embedded with pictures can be more effective in sight word instruction than one using words alone.(**Strauber, C. B., Sorcar, P., Howlett, C., & Goldman, S. 2020)**. Pictures assisted young children to identify and learn new words in a relatively short period of time.(**Meadan, H., Stoner, J. B., & Parette, H. P. 2008)**)

Visual representation is used as an introduction to vocabulary for a deaf or hard of hearing student. These techniques were effective for the student to be able to maintain comprehension. The results showed significant gains in Dolch sight word acquisition in favor of the flash card combined with picture and sign language.(**Gallion, T. 2016)**. Dolch Sight words is taken in this study since it will have a significant role in improving the vocabulary of Hearing-impaired Students. The development of sight word recognition continues to be a top priority when instructing emerging and beginning Hearing Impaired students.

The rationale clearly depicts that using more than one strategy in teaching sight words outputs an effective learning outcome of Hearing-Impaired Students. So Multi-Modal approach is used in this study for teaching Dolch Sight Words. Hence

this study will promote the Hearing Impaired Students' confidence and promote their reading comprehension and it also provide clues to the context of the text.

1.6.0 Statement of the Problem

Problem of the study is worded as "**Multimodal Intervention System for Developing Sight Words among Students with Hearing Impairment".**

The study sought to provide answer to this question:

i. Is Multimodal Intervention System effective method in teaching sight words for students with hearing impairment?

1.7.0 Objectives of the Study

The present study aims at:

1. Identify the students with hearing impairment in Inclusive and Special schools.
2. Develop Multimodal Intervention System for learning Sight Words among students with hearing impairment.
3. Examine the distribution of different demographic variable present among the selected sample.
4. Assess the level of acquisition of Alphabet concepts among students with hearing impairment before and after introduction of Multimodal Intervention System.
5. Assess the level of acquisition of Numeral concepts among students with hearing impairment before and after introduction of Multimodal Intervention System
6. Assess the level of acquisition of Sight Words among the students with hearing impairment before and after introduction of Multimodal Intervention System.
7. Compare the mean scores obtained in pretest, intermediate test and posttest.
8. Study the influence of Grade, Gender and Type of School and their interaction on Alphabet concepts.
9. Study the influence of Grade, Gender and Type of School and their interaction on Numeral concepts.

10. Study the influence of Grade, Gender and Type of School and their interaction on Sight Words.

1.8.0 Hypothesis of the Study

1. There is no significant difference in the level of acquisition of Alphabet concept among students with hearing impairment before and after introduction of Multimodal Intervention System.
2. There is no significant difference in the level of acquisition of Numeral concept among students with hearing impairment before and after introduction of Multimodal Intervention System.
3. There is no significant difference in the level of acquisition of Sight words among students with hearing impairment before and after introduction of Multimodal Intervention System.
4. There is no significant difference when compared the mean scores of Gender before and after introduction of Multimodal Intervention System.
5. There is no significant difference when compared the mean scores of Grade before and after introduction of Multimodal Intervention System.
6. There is no significant difference when compared the mean scores of Type of School before and after introduction of Multimodal Intervention System.
7. There is no significant influence of Gender, Grade and Type of School and their interaction on Numeral concepts before and after introduction of Multimodal Intervention System.
8. There is no significant influence of Gender, Grade and Type of School and their interaction on Alphabet concepts before and after introduction of Multimodal Intervention System.
9. There is no significant influence of Gender, Grade and Type of School and their interaction on Sight Words before and after introduction of Multimodal Intervention System.

1.9.0 Terms Used in the Study

1.9.1 Hearing Impairement

Hearing impairment is a term which refers to any problem in hearing irrespective of degree or etiology. Rights of Persons with Disability Act, (RPwD Act,

2016), define “deaf" as persons having 70 dB hearing loss in speech frequencies in both ears; and "hard of hearing" as person having 60 dB to 70 dB hearing loss in speech frequencies in both ears. The higher the decibel (dB), the louder is the sound.

1.9.2 Sight Words

Sight words are the set of words that is constantly repeated in a paragraph. The name “sight words” itself tells us that readers recognize these words by sight.

In the present study, 25 Sight words are used. Out of these 25 words, 11 words are taught using multi-modal intervention system while the other 14 words are taught using traditional teaching method. The 25 selected Dolch sight words are given as follows:

Figure 1.1.0 Dolch Sight Words at Primary Level

FOR	**THEY**	**OF**	**AN**	**THEN**
AND	**THE**	**SHE**	**ON**	**THEM**
ONCE	**SAID**	**BUT**	**ARE**	**AS**
HAD	**IN**	**IS**	**FROM**	**HAS**
WAS	**YOU**	**TO**	**BY**	**HIS**

1.9.3 Alphabet

Alphabet are taught as a pre-requisite to learn sight words. Indian sign language is used to teach alphabets to the students. All the 26 letters in the alphabet; both capital and small letters are taught in 4 different modes:

1 Fingerspelling
2 Sign language
3 Oralism
4 Oralism & Sign language

Figure 1.2.0: Alphabets

1.9.4 Numerals

Numerals from 1-10 is taught to students with hearing impairment as many sight words involve concepts that are related to numbers. Hence teaching numerals was also taken as a pre-requisites for learning sight words.

Figure 1.3.0: Numerals

1.9.5 Multimodal Intervention Strategy

Multimodal learning in education means teaching concepts using multiple modes. Different modes help to interact with each other, creating a dynamic learning experience. Students come to school with a wide variety of learning styles. The ideal educational experience should represent all modes and support each of these styles. Multimodality supports a universal design for learning by communicating concepts in the most effective ways and making sure everyone gets exactly what they need. Multi-modal Intervention System for the students with Hearing Impairment focuses on teaching Dolch sight words to primary school students using a computer assisted program with different strategies for long retention of the words in their memory.

This is done in three different modules:

1. Pre-requisites for Learning Sight Words
2. Introduction to Sight Words
3. Procedure to learn sight words through 7 different strategies

There are 7 strategies used in the Multimodal Intervention in this study. After teaching 11 sight words at the primary level through videos, evaluation is done for 11

words using the multi-modal intervention and 14 words without using multi-modal intervention which makes a total of 25 words.

1. Finger spelling
2. Arm Tapping
3. Air Writing
4. See and Say
5. Sign Language
6. Table Writing
7. Usage of Words in a Sentence

Modes of learning are a set of guidelines that describe the methods human use to acquire, process, and maintain knowledge (Nathan Harada). Individuals differ in how they learn effectively; most people prefer -The major channels or modes of information for Students with Hearing Impairment children are-. Use of technology in learning is highly effective in developing knowledge among the Students with Hearing Impairment.

Use of technology is one of the most used techniques for educational purpose and this includes the education for students with Hearing Impairment. However, most technology available does not particularly be useful to those students due to its feature which is lacking in terms of adaptability. They often encounter problem in accessing the information available in terms of understanding it and using it in a proper manner (Fichten, Ferraro, Asuncion, Chwojka, Nguyen, Klomp & Wolforth, 2009). Therefore, in order to assist these HI students in accessing the information adequately, the technological tool needs to be developed and designed according to the needs of the HI students by adding or enhancing some features within the inclusive classroom.

The Students with Hearing Impairment among grade 1 to 5 are selected as the samples for the present study. In the present study SWHI means the Children with Hearing Impairment studying in Special and Inclusive schools.

1.10.0 Scope of the Study

The study may provide systematic way of teaching sight words to the Students with Hearing Impairment. The outcome may be helpful to the special educator, general educators, parents, teacher educators to understand the significance of sight words in teaching of English in the life of children with Hearing Impairment. The study findings may provide instructions on the ways to modify teaching to suit the hearing impaired student and the need to understand deafness so they are able to

accommodate them in inclusive classrooms. In addition, these findings contribute to the academic fields to incorporate a component in the curriculum. The study has made recommendations on areas that require further research. In this sense, this research has provided leads for other related studies in the future.

1.11.0 Delimitations of the Study

1. The present investigation being a Quasi- Experimental study was confined to only 30 samples. Sample size is limited due to less availability of time and specifically due to scattered population of Children with Hearing Impairment.
2. This study was confined to only two schools in Calicut and was restricted to primary class students of classes I to V studying in Special and Inclusive schools.
3. The current covid pandemic situation also limits the performance of this study.

1.12.0 Organization of the Study

The study on "**Multimodal Intervention System for Developing Sight Words among Students with Hearing Impairment**" is reported in five chapters.

CHAPTER I: First Chapter includes the Introduction, Definitions, Multimodal Intervention System, Objectives, Rationale, Scope and Delimitations of the study.

CHAPTER II: The second chapter presents the Review of Literature related to the topic.

CHAPTER III: The third chapter explains the procedure, methods adopted in the study, construction of tools, selection of samples, administration of the tools and Data collection procedure.

CHAPTER IV: The fourth chapter deals with the tabulation, analysis and interpretation of the data in detail.

CHAPTER V: The fifth chapter reports the findings, recommendations and suggestions. This is followed by bibliography and appendices.

The review of related literature is presented in the next chapter.

CHAPTER II
REVIEW OF LITERATURE

2.0.0 Introduction

Once a topic has been selected the investigator is naturally eager for action. It is a mistake to rush into planning and carrying out study before making a thorough survey on what is already known in the field of interest. The topic must be related to relevant knowledge in the field. This chapter reviews the important literature related to the study. It provides a background for the development of the present study and brings the reader up to date.

"A literature review surveys books, scholarly articles and any other sources relevant to a particular issue, area of research or theory and provides a description, summary and critical evaluation of these works in relation to the research problem being investigated". - Fink, Arlene, (2014).

A Literature Review is "a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners" by Fink, A (2005).

A literature review is a "comprehensive study and interpretation of literature that addresses a specific topic" (Aveyard, 2010). It is an opportunity to tell our story by carving a space for our topic and research question in relation to previous studies. In reporting our critical perspective on the relevant literature and identifying a gap that our research will attempt to address, it situates and establishes the importance of our topic or question within the broader academic community in our discipline or field of study.The literature in any field forms the foundations upon which all future work will be built. If we fail to build the foundation of knowledge provided by the review of literature our work is likely to be shallow and native and will often duplicate work that has already been done better by someone else **(Borg, W.R., 2005).**

A literature review is the collection of a scholarly articles, books, journals, dissertations, conference proceedings and other resources which are relevant to a particular issue, area of research, or area of problems and provides a path down to

follow the past researches for an effective use in the present study. A review of literature is both the process and the product where it provides a descriptive and logical conclusion of the materials existed based on specific area or topic of the study. A literature review process involves a study about an existing scholarly articles. A literature review seeks to explain, conclude, analyse, clarify and evaluate the data bases of primary reports such as written documents of prior researches **(Cooper, H.M., 1988).**

2.1.0 Purpose of Literature Review

The review of related literature involves the systematic identification, location and analysis of documents containing information related to the research problem. The search for related literature should be completed before the actual conduct of study begins. It should give a theoretical base for the research to determine the nature of research. The literature review acknowledges the work of previous researchers, and in so doing, assures the reader that your work has been well conceived. It is assumed that by mentioning a previous work in the field of study, that the author has read, evaluated, and assimilated that work into the work at hand.

A review of literature is one of the important steps in the research process. The main purpose of a literature review is to know about the work that already exists at a particular area of research and share the knowledge in order to find a new solution to the problem by new researchers. The review of related literature gives an overview of the work that has been done in the field and about the recent development. The review of related literature involves locating, evaluating the related studies carried out earlier and also the causes, observations and opinions that are related to any research problem, to be explored. One of our important responsibilities in research is to compare the findings with those of others, and that is why we said review of literature plays a very important role in the research process.

- Identifies gaps in theories
- Helps to avoid repeating the same intervention used in the research which already conducted on a topic
- Identify new ways to interpret the previous researches
- Identify the areas of prior researches to prevent duplication of effort

- Provide knowledge about methods and standardized tools can be supported to our research
- Sets the background on what has been explored on a topic so far
- Provide the intellectual context of the new study and position of this research with other related research.

The related review studied has been structured under the following headings:

2.2.0 Prevalence of Hearing Impaired Population- Global and National
2.3.0 Education of Students with Hearing Impairment in Special School
2.4.0 Education of Students with Hearing Impairment in Inclusive School
2.5.0 Early Childhood Education for Students with Hearing Impairment
2.6.0 Teaching Method to Students with Hearing Impairment in Online Mode
2.7.0 Oral Method of Teaching
2.8.0 Sign Language as Method of Teaching
2.9.0 Total Communication
2.10.0 Oral VS Sign Language
2.11.0 Teaching Mathematics to Students with Hearing Impairment
2.12.0 Teaching Science to Students with Hearing Impairment
2.13.0 Teaching Social Science to Students with Hearing Impairment
2.14.0 Teaching Language to Students with Hearing Impairment
2.15.0 Teaching Second Language to Students with Hearing Impairment
2.16.0 Method of Teaching Second Language
2.17.0 Teaching Sight Words to Children
2.18.0 Teaching Sight Words to Hearing Impaired Children

2.2.0 Prevalence of Hearing Impaired Population- Global and National

Garg, S., Kohli, C., Mangla, V., Chadha,S., Singh, M. M.& Dahiya, N. (2018) conducted ***"An Epidemiological Study on Burden of Hearing Loss and Its Associated"***. This study was carried out in selected rural and urban areas of Delhi, India, shows very high prevalence of hearing loss. The study carried out among people living in the Delhi area in India showed an overall prevalence of hearing loss of 26.9 percent among persons aged 5 years and over. 15.8 percent had a sensory-

neural hearing loss, 10.3 percent had a conductive hearing loss and 0.8 percent had a mixed hearing loss.

Kapoor, P. (2019) presented a statistical study on Hearing Loss. A whopping 466 million people in the world have disabling Hearing Loss. Of which 34 million are children alone. Disabling Hearing Loss refers to Hearing Loss greater than 40 decibels(dB) in the better ear in adults and a Hearing Loss greater than 30 (dB) in the better hearing ear in children. Unaddressed Hearing Loss poses an annual global cost of US$750 billion.

Children with hearing loss have difficulty with all areas of academic achievement, especially reading and mathematical concepts. Children with mild to moderate hearing losses, on average, achieve one to four grade levels lower than their peers with normal hearing, unless appropriate management occurs.

2.3.0 Education of Students with Hearing Impairment in Special School

Millicent, Malinda, Musyoka., Mary, Anne, Gentry & James, Joseph. (2015) study on***"Voices from the Classroom: Experiences of Teachers of Deaf Students with Additional Disabilities"*** is to investigate experiences of K-12 classroom teachers of deaf students with additional disabilities. Today, more deaf and hard of hearing students are identified as having additional disabilities (Bruce, DiNatale & Ford, 2008; Ewing, 2011; Gallaudet Research Institute, 2011; Jones, Jones & Ewing, 2006; Mitchell & Karchmer, 2004); there is a need to explore ways of providing educational services to these students. Several themes emerged, such as the typical school day, previous training, and continuous professional development. The study revealed that the understanding the experiences of the K- 12 teachers can provide valuable information for deaf education teacher preparation programs.

Xu, B. (2018) conducted a study entitled "***Using New Media in Teaching English Reading and Writing for Hearing Impaired Students-Taking Leshan Special Education School as an Example".*** In this paper the authors focus on their experience of teaching English as a foreign language to deaf and hard-of-hearing people. Teaching English to hearing-impaired people is an incredible challenge. Deaf and hard-of-hearing people have phonological difficulties, which affect not only their speaking and listening skills but they influence their way of retaining and expressing

information, their organizational skills, their memory. The authors will point out the teaching methods and learning strategies which they find relevant in this specific classroom situation and that can help these people become aware of the culture of English speaking countries and also focus on the development of their reading and writing skills in the foreign language.

This paper constructs an interactive mode in which teacher teaches hearing impaired students English reading and writing through multimedia in class on-line and students learn English via smart cell phone, Ipad, wechat, Mooc, Microblog off-line. The online and offline class constitutes a whole learning mode for them. Through this mode, this paper puts forward some strategies and methods to train reading and writing competence for hearing impaired students.

Jensema, C. (1975) studied "***The Relationship Between Academic Achievement and the Demographic Characteristics of Hearing Impaired Children and Youth".*** Academic achievement test data from a nationwide random sample of 6,873 students enrolled in special educational programs for the hearing impaired in spring, 1974, were considered in relation to the demographic characteristics of the students. After statistical rescaling to eliminate the influence of age, the data clearly showed some strong relationships between test scores and such demographic variables as age at onset of the hearing loss, the cause of the loss, the degree of the loss (as better ear average), additional handicapping conditions, ethnic background, and type of special educational program.

Dewi, A. A., Yawisah, U., & Siregar, S. (2019) studied **"*Teaching English to children with hearing impairment: a case study in special school".*** The success of the English language program at the Tutorial Center of Gallaudet College is due to the fact that it uses English-as-a-second-language methodology and not the methods of remedial English. As in all ESL classrooms, students who cannot yet express themselves adequately in English spend no time attempting to study grammar, learn rules of effective composition, or gain knowledge of subject matter in that language. Rather they spend time producing language in conformity with reliable models provided by the teacher.

2.4.0 Education of Students with Hearing Impairment in Inclusive School

Mr John, Mpofu and Mr Sylod, Chimhenga. (2013) conducted a study on ***"Challenges faced by Hearing Impaired pupils in learning: A case study of King George VI Memorial School".*** it focused on Students with Hearing Impairment (HI) who are experiencing challenges in most learning institutions of Zimbabwe. Most schools that enroll them in the majority of cases do not cater for their special needs. Some of their challenges are not dictated until too late as a result the hearing losses in these pupils become a hindrance to their learning process. This research article highlighted the challenges faced by pupils with hearing loss and to suggest how best teachers can handle this challenge. The research used a descriptive case study method to extract information from students with HI and discuss through focus group discussions the challenges the teachers grapple with when teaching pupils with hearing loss. A teacher can use sign, finger spelling and speech reading. Equipment, including overhead projectors, bulletin boards, computers and televisions showing captions on the screen, can also be used in teaching.

Nordin, Norazah., Yunus, Melor., Zaharudin, Rozniza., Salehi, Hadi., Yasin, Mohd. & Embi, Mohamed. (2015) conducted a study *on* ***"Identifying the challenges and barriers hearing-impaired learners face with using ICT education courses".*** This research aimed to identify the problems and challenges among the hearing impaired individuals in learning the various ICT - Education (Information and Communication Technology) courses for connecting the ICT courses and the deaf learners for further education. To achieve the aim of this study, analysis was carried out in all schools in Malaysia, including Sabah and Sarawak, which employ the hearing-impaired education program for the secondary level of Form 4 and Form 5. This analysis was done in the forms of survey questionnaires, interview sessions, and observation. Teachers were chosen as respondents mainly because they are the main individuals that interact directly with the hearing-impaired individuals. Therefore, their views and opinions about the suitable ICT courses for the hearing-impaired students were greatly appreciated and needed. According to the problems stated, an e-learning portal offering ICT courses was needed to be developed especially for the hearing-impaired individuals to solve the problems. The hearing-impaired individuals

deserve the equal opportunities as the normal-hearing individuals to learn ICT education; hence, they would not be left behind in learning computer courses.

Bess, F. H., Dodd-Murphy, J., & Parker, R. A. (1998) studied "***Children with minimal sensorineural hearing loss: prevalence, educational performance, and functional status".*** This study was designed to determine the prevalence of minimal sensorineural hearing loss (MSHL) in school-age children and to assess the relationship of MSHL to educational performance and functional status. Children with MSHL exhibited significantly greater dysfunction than children with normal hearing on several subtests of the COOP including behavior, energy, stress, social support, and self-esteem.

Children with MSHL experienced more difficulty than normally hearing children on a series of educational and functional test measures. Results suggest the need for audiologists, speech-language pathologists, and educators to evaluate carefully our identification and management approaches with this population. Better efforts to manage these children could result in meaningful improvement in their educational progress and psychosocial well-being.

2.5.0 Early Childhood Education for Students with Hearing Impairment

Downs, M. P., & Yoshinaga-Itano, C. (1999) studied "***The efficacy of early identification and intervention for children with hearing impairment"***. Clinicians who work with children who are hard of hearing have always known that the earlier such children are given training, the better the outcome will be. But the concept was not accepted generally because it was said that "there are no hard data to prove that earlier is better." Unfortunately, it has been difficult to obtain these data because when one is dealing with a physical handicap for which known treatment is available, the classic research design breaks down. What researcher would deny treatment to a newborn found with phenylketonuria.

Van der Straaten, T. F., Briaire, J. J., Dirks, E., Soede, W., Rieffe, C., & Frijns, J. H. (2021) studied ***"The school career of children with hearing loss in different primary educational settings-a large longitudinal nationwide study"***. This study attempts to address this problem by evaluating the prevalence and pattern of hearing impairment in school entrants. Children with hearing loss (HL) are at risk for

a lower educational achievement. This longitudinal study compared the school career of a nationwide Dutch cohort with and without HL based on descriptive data of the governmental authority Statistics Netherlands. From 2008 to 2018, 3,367,129 children, of whom 1,193 used cochlear implants (CIs) and 8,874 used hearing aids (HAs), were attending primary and/or secondary education. Sixty-one percent of children with HL attended mainstream and 31% special primary education. Compared to mainstreamed pupils without HL, mainstreamed pupils with HL achieved lower levels for language and mathematics in primary education but eventually attended comparable types of secondary education. Children with HL attending special primary education attained lower types of secondary education compared to mainstreamed peers with and without HL. These findings suggest that future educational (and as a result professional) attainment of a child with HL depends on the type of primary educational setting.

2.6.0 Teaching Method to Students with Hearing Impairment in Online Mode

Hisyamuddin, Hashim., Zaidatun, Tasir. & Siti, Khadijah, Mohamad. (2013) conducted a study on ***"E-Learning Environment for Hearing Impaired Students"***. This paper reviews some of the past researches on the usage of the e-learning environment for hearing impaired students for the past decade or so. There are a lot of disabled individuals who have the right to get the best education as they can get, just like their normal peers. Hearing impaired (HI) individuals are among those of people with disabilities that deserve the same rights. Hearing impaired individuals, particularly hearing impaired students, usually acquire the same level of mental capability as the normal hearing students in terms of studying.

Dr Diane, Bell. (2020) conducted a study on ***"How to help students with a hearing impairment as courses move online"***. The study focused as higher education institutions scramble to take their teaching online, lecturers require some help to make material accessible to all students. Some students may have a hearing impairment and make use of technology such as hearing aids or cochlear implants. Even under the best circumstances, their accessibility needs are frequently unmet. In this COVID-19 pandemic, with little time to prepare, the focus is understandably on accommodating the majority of students, but this leaves many students further marginalised. The study

concluded that in the online environment, the challenges of the hearing impaired can be even greater without the use of various strategies. They might not be able to hear what the lecturer is saying (audio is distorted through technology). Other challenges include absence of closed captions or subtitles, not being able to quickly check with a peer what was said, and not having manual or electronic notes immediately available to them.

Abdallah, A., Alshawabkeha, M., Lynn, Woolsey., Faten, F. & Kharbatca. (2021) conducted a study on ***"Using online information technology for deaf students during COVID-19: A closer look from experience".*** The COVID-19 pandemic has interrupted the education of millions of students across the world. The purpose of the study was to investigate the perceptions regarding the technological instruction and accommodations provided to deaf students in online distance learning during the COVID-19 pandemic. This study was qualitative in nature and used anonymous, one-to-one semi-structured interviews. In June 2020, they interviewed a convenience sample of deaf students (n = 15) and their instructors (n = 3) and analysed the responses thematically. Upon achieving theme saturation, the thematic structure analysis was finalised. The results revealed five main themes related to deaf students' experience with online distance learning during COVID-19. The themes are as follows: course content delivered, technology used, delivery method, assessment tools used, and social interactions. The interviewed students described their experience of using online technology in both negative and positive terms. Instructors also provided their input to express their experiences during that time. Online distance learning was described as a difficult and challenging experience that lacked efficient communication channels and failed to address the needs of the deaf with respect to the communication medium. The typical course delivery methods were described as challenging, and the lack of social interaction was highlighted as a liability. At the same time, participants acknowledged some ancillary benefits of online distance learning especially that it enhanced their technology skills and their competences in adapting to a new environment.

Chad, E, Smith & Tamby, Allman. (2010) conducted a study on ***"Meeting the Challenges of Deaf Education Teacher Preparation: Innovative Practices in Online Learning".***Bond (2000) and Scheetz and Martin (2008) identified

characteristics of effective teachers, and qualities of master teachers of the deaf. Combining those characteristics and qualities into a single teacher of the deaf training program allows for the creation of effective teachers of the deaf. Methods for applying the characteristics into teacher training courses in an online format are detailed. The research included the suggestions for promoting effective learning strategies in online environments.They used combinination of effective pedagogy and innovative technology, online learning can clearly be an effective tool for the delivery of teacher of the deaf training content.

2.7.0 Oral Method of Teaching

Turan, Z. (2010) studied ***"An Early Natural Auditory-Oral Intervention Approach for Children with Hearing Loss: A Qualitative Study"***. This study aims to examine the session goals and their realization during the session flow for a child with a hearing loss and his mother in an early intervention program. The study was designed as a case study. Video recordings of the intervention sessions, reflective journals, session plans, and the plan evaluations were used to collect and analyze the data.

Findings indicate that session goals focused on the mother-child interaction, the use of language learning opportunities during the interaction, improving the mother's play skills, improving the child's listening skills, and behavior management of the child. Daily routines, observations during the sessions and theoretical background of the teacher seem to be important factors while establishing the session goals.

Pressnell, L.M (1973) studied ***"Hearing-impaired children's comprehension and production of syntax in oral language*".** The acquisition and development of syntax in oral language for 47 congenitally hearing-impaired children between the ages of five years and 13 years, three months, was compared with that of normal children. The Northwestern Syntax Screening Test was administered and a 50-sentence spontaneous-language sample was scored and analyzed. In addition to the significant differences found in the rate of acquisition of syntax in favor of the normal children, some differences were found in the sequential order of development for particular verb constructions. The investigator hypothesized that such differences

were related to the teaching order in the classroom and to the degree of visual-auditory cues inherent in the language constructions for the hearing-impaired children. Information from the case histories was used in an attempt to identify the factors contributing to the development of syntax for the hearing-impaired subjects. Of the six factors considered, only chronologic age and severity of hearing impairment were identified as contributing factors for these subjects. However, those hearing-impaired children who have achieved good oral language skills would be attending schools with hearing children and, therefore, were not represented in this study.

2.8.0 Sign Language as Method of Teaching

Rastgoo, R., Kiani, K., Escalera, S., & Sabokrou, M. (2021) studied **"*Sign language production: A review*".** Sign Language is the dominant yet non-primary form of communication language used in the deaf and hearing-impaired community. To make an easy and mutual communication between the hearing-impaired and the hearing communities, building a robust system capable of translating the spoken language into sign language and vice versa is fundamental. To this end, sign language recognition and production are two necessary parts for making such a two-way system. Sign language recognition and production need to cope with some critical challenges. In this survey, we review recent advances in Sign Language Production (SLP) and related areas using deep learning. This survey aims to briefly summarize recent achievements in SLP, discussing their advantages, limitations, and future directions of research.

Kumar, N. (2017) studied ***"Sign language recognition for hearing impaired people based on hands symbols classification***". Understating the exact context of symbolic expressions is challenging job in the social media until unless it is properly specified. This problem finds a communication gap between the people belonging to different community. Communication is always having a great impact in every domain and how it is considered the meaning of the thoughts and expressions that attract the researchers to bridge this gap for every living being. In this work, we proposed an idea for feasible communication between hearing impaired and normal person with the help of machine learning approach. Instead of preprocessing techniques, like filtering and segmentation of hand patch images, we extract features

from our dataset by discrete wavelet transform. The dimension of the feature vector is reduced by linear discriminant analysis. Both linear discriminant analysis (LDA) and support vector machine (SVM) are used on the basis of tenfold classification to recognition sign language symbols. This work ensures the 97.3% accuracy on random sign symbolic dataset of gestural communication.

Süzgün, M., Özdemir, H., Camgöz, N., Kindiroğlu, A., Başaran, D., Togay, C., & Akarun, L. (2015) studied "***Hospisign: an interactive sign language platform for hearing impaired".*** Sign language is the natural medium of communication for the Deaf community. In this study, we have developed an interactive communication interface for hospitals, HospiSign, using computer vision based sign language recognition methods. The objective of this paper is to review sign language based Human-Computer Interaction applications and to introduce HospiSign in this context. HospiSign is designed to meet deaf people at the information desk of a hospital and to assist them in their visit. The interface guides the deaf visitors to answer certain questions and express intention of their visit, in sign language, without the need of a translator. The system consists of a computer, a touch display to visualize the interface, and Microsoft Kinect v2 sensor to capture the users' sign responses. HospiSign recognizes isolated signs in a structured activity diagram using Dynamic Time Warping based classifiers. In order to evaluate the developed interface, we performed usability tests and deduced that the system was able to assist its users in real time with high accuracy.

2.9.0 Total Communication

Mayer, P., & Lowenbraun, S. (1990) studied ***"Total Communication Use Among Elementary Teachers of Hearing-Impaired Children".*** This study examined the degree to which teachers' signed Manually Coded English messages represented their spoken utterances. Results indicate that educators in early elementary programs can, and do, provide a complete manual representation of their spoken English messages. This is in contrast with earlier research with middle school educators and parents of hearing-impaired children. Findings indicate that MCE proficiency may be influenced both by teacher attitude regarding the importance of signing a complete message and the degree to which program supervisors monitor teacher implementation of clearly specified MCE policies.Findings from this study have

implications for programs to train teachers in using MCE and also provide information on the effects of program policy on teacher use of sign language.

Wandel, J. E. (1989) studied **"*Use of internal speech in reading by hearing and hearing-impaired students in oral, Total Communication, and Cued Speech programs".*** This study investigated the relationship of recall in short-term memory (STM), use of internal speech (IS) as a SIM coding strategy, and reading comprehension. It compared the reading achievement of hearing-impaired students in Oral, Total Communication (TC), and Cued Speech (CS) communication modes with that of students with normal hearing. The study replicated parts of the Conrad (1979) study, using his materials, procedures, and lists of acoustically similar and visually similar words. The design utilized hearing-impaired students from three communication modes (Oral, TC, CS) and two levels (severe, profound) of hearing impairment. A hearing group was used for comparison. In all, 213 students, ages 7-16 years, were tested in order to select 30 hearing students, 30 from Oral programs, 30 from TC programs and 30 from CS programs. Each group of 30 hearing-impaired students included 15 in the profound-loss category (PTA 90 dB or more in the better ear) and 15 in the severe-loss category (65 to 89 dB). Each subgroup (communication mode/decibel level) was balanced for decibel loss, general cognitive ability, years in communication mode, sex, and parent education level. Additional factors were racial/ethnic origin, educational placement, communication support at home, and hand preference for writing. The hearing-impaired students were randomly selected from several public school districts throughout the country that offered all three (Oral, TC, CS) communication modes, had offered those tracks for at least three years, and administered the Stanford Achievement Tests (SAT).

Beckmeyer, T. (1976) studied ***"Receptive abilities of hearing impaired students in a total communication setting".*** An association learning task was given to 22 deaf subjects, mean chronological age of 13 years 6 months, who had stated a preference for an oral or manual mode of communication. Five modes of communication or combinations of modes were used in presenting the information to be learned. Results suggested that combining the modes of communication did not produce better learning than using the component modes alone. There was no difference between the oral mode and sign language for the 22 subjects as a group.

The manual preference group performed best on sign language. There was no significant difference between results observed on the oral mode or sign language for the oral preference subjects. All groups compared had their lowest scores on finger spelling. There was no significant difference between the oral and manual preference groups on any of the modes of communication or combinations of modes used.

2.10.0 Oral vs Sign Language

Bertone, C., & Volpato, F. (2009) studied ***"Oral language and sign language: possible approaches for deaf people's language development*".** Deafness is a sensory impairment which strongly affects the normal acquisition and development of linguistic abilities. Deaf people are severely hindered in the development of oral speech because they do not have direct access to the linguistic input and many of them do not acquire much more than the rudiments of oral communication. While hearing children acquire easily and naturally a spoken language, deaf children might acquire in the same way a sign language, exploiting the visual modality. This study investigated the general linguistic competence in Italian of four different groups of deaf individuals (orally-trained children with cochlear implants, native signers, non-native signers and deaf foreigners adolescents and adults), by using a standardized picture matching task, in order to determine the level of their linguistic competence. Results revealed that most deaf individuals showed a performance comparable to that of very young hearing children. Cochlear implanted children performed significantly better than all the other groups, and the less accurate performance was that of foreigner deaf students, who often have not any kind of underlying language. Despite the better performance of cochlear implanted children, who generally do not use the sign language, the best solution to approach the oral language would appear to be the combination of oral training and sign language, in order to be able to communicate with both the deaf and the hearing communities.

Dunst, C. J., Meter, D., & Hamby, D. W. (2011) studied **"*Influences of sign and oral language interventions on the speech and oral language production of young children with disabilities*".** The influences of sign and oral language interventions on the speech and oral language production of preschool-aged children with different types of disabilities were examined in 33 studies including 216

children. The children's disabilities included autism, Down syndrome, intellectual and developmental disabilities, social-emotional disorders, and physical disabilities. All of the studies used some type of simultaneous communication (oral language together with some type of sign language) to promote the children's increased use of vocal or verbal behavior. Results showed, regardless of type of sign language, that simultaneous communication facilitated the children's production of speech and oral language. The interventions also had positive effects on child speech and oral language production regardless of other variables, including type of child disability and the different conditions of the interventions. Implications for practice are described.

Luterman, D. M. (1976) studied **"*A comparison of language skills of hearing impaired children trained in a visual/oral method and an auditory/oral method".*** As part of a follow-up study, 49 hearing impaired children were reevaluated for language skills. Of these 49 graduates of a parent-centered nursery program, 27 had received visual/oral treatment and 22 had received auditory/oral treatment. ITPA and NSST testing indicated no statistically significant differences between the groups despite a two-year advantage for the visually/orally trained children. Thirty-six percent of the children trained in the auditory/oral approach were in totally integrated educational settings as compared to less than ten percent of those trained in the visual/oral approach. Results indicated an educational advantage in the auditory/oral approach compared to the more traditional visual/oral approach.

2.11.0 Teaching Mathematics to Students with Hearing Impairment

Tanridiler, A., Uzuner, Y., & Girgin, U. (2015) studied **"*Teaching and learning mathematics with hearing impaired students".*** The purpose of this action research was to analyze the teaching efforts of mathematics to seventh grade hearing-impaired students at the Education and Research Center for Hearing Impaired Children (ERCHIC). The data were collected via video recordings of the group and individual mathematical instructions; the audio recordings of the reflective meetings, lesson plans, exams, reflective diaries, data evaluation charts, and interviews; and the files related to the students' mathematics work in 2009-2010. Different quantitative and qualitative data analysis techniques have been applied before, during, and after

the research process. It was observed that the students participating in the study have benefited from the application of balanced mathematics instruction (BMI). In addition, this study is thought to contribute to the related literature and to create a structure for teaching mathematics to hearing-impaired students. The study is also expected to contribute to the curriculum of mathematics that will be developed for hearing-impaired students in Turkey.

Ray, B. E. (2015) studied ***"Discovering mathematics: The challenges that deaf/hearing-impaired children encounter".*** This paper reports on difficulties that deaf/hearing-impaired children may encounter when learning mathematics in early childhood settings. The objective was to enhance teacher practice by identifying possible ways in which barriers to learning could be overcome. The key issue arising revealed that deaf/hearing-impaired children's limited language base may prevent them from understanding and developing mathematical language. Other related issues that influenced mathematical development were parental involvement and comprehensive support in the home environment, together with a greater emphasis on the use of mathematical resources and specific strategies for teaching mathematics to deaf/hearing-impaired children.

Swanwick, R., Oddy, A., & Roper, T. (2005) studied ***"Mathematics and deaf children: an exploration of barriers to success".*** Consistent evidence from research studies between 1980 and 2000 indicates that deaf children lag behind hearing peers (by 2 to 3.5 years) in mathematics. This study seeks to explore the reasons for this persistent underachievement by focusing on results from the National Mathematics tests taken in the UK by all 14 year olds. The study analysed a sample of test papers with the aim of identifying ways in which deaf and hearing responses to the test items differed and possible explanations for these differences in terms of access to the mathematics teaching, assessment and curriculum provision. Findings from the project led to preliminary conclusions regarding the range of national test entry levels for deaf pupils, the types of linguistic issues they encounter, the learning strengths they demonstrate and their experience of mathematics curriculum provision. The concluding analysis raises significant questions about deaf pupils' access to mathematics educational provision and more specifically about the deaf experience of mathematics learning and how they perceive themselves as mathematicians.

2.12.0 Teaching Science to Students with Hearing Impairment

Lang, H. G., & Propp, G. (1982) studied **"*Science education for hearing-impaired students: State-of-the-art*".** A 37-item questionnaire was returned by 480 science teachers representing 326 school programs serving deaf students. Questions were asked about education, training and experience, and the quality of instructional materials, curriculum resources, and facilities. In an attempt to identify major needs in science education for deaf students, it was found that science is a highly neglected area of the curriculum in most school programs.

Im, S., & Kim, O. J. (2014) studied **"*An approach to teach science to students with limited language proficiency: In the case of students with hearing impairment*".** For over two decades, there has been increasing concern regarding the science learning of disadvantaged students such as indigenous or disabled students. The academic achievement of students with hearing impairment has been seen as relatively low. This low achievement has been mainly due to students' poor literal ability and not because of their low intellectual ability. Interactive experiences and the repeated use of previously learned terms have been suggested as being important to improve their literacy. In addition, it is well recognized that for all students to experience success in science education, literacy needs to be considered as a crucial factor when setting educational goals among students with limited language proficiency. This study presents a strategy for teaching science to students with limited language proficiency based on a teaching strategy which deliberately focuses on written expression in the context of hands-on scientific activities. The influence of this teaching strategy upon hearing impaired students' language proficiency and inquiry skills was also examined. Results revealed the students' language proficiency was enhanced in terms of fluency of expression, and their inquiry skills were also improved as compared to the students in a control group among whom the teaching strategy was not used. These results demonstrated that this teaching strategy which focuses on students' written expression and inquiry skills through scientific activity can improve the literacy of students with limited language proficiency as well as increase their learning success in science.

Susetyo, B. U. D. I., Maryanti, R. I. N. A., & Siswaningsih, W. I. W. I. (2021) studied ***"Students with hearing impairments' comprehension level towards the exam questions of natural science lessons".*** This study aims to determine students with hearing impairments' comprehension level towards the natural science examination questions. This research uses a descriptive exploratory method. The subjects of this study are 14 grade six students who study at a special school for hearing impairment in Bandung, Cimahi, and Wonosobo. We use 40 multiple choice questions as an instrument for evaluating students' comprehension level. In addition, we use descriptive statistics in data analysis techniques. The results show that students with hearing impairments comprehension are low because most students have an average score below or less than 0.5. The average score for the student's comprehension level in total is 0.477. The average value of the material scope is 0.411, the average value of the material is 0.48, and the average value of the indicators is 0.45. The low comprehension level is caused by the choice of words in the questions that are not adjusted to students with hearing impairments' characteristics as they have limited comprehension of more and complex vocabulary. The results of this study are expected to serve as a reference for improving the quality of national standard learning services for students with hearing impairments.

2.13.0 Teaching Social Science to Students with Hearing Impairment

Cynthia Szymanski Sunal, Mary Semler Paul & John Demary(1981) studied **"*Social Studies for the Hearing Impaired: The State of the Art,Theory & Research in Social Education*".**The purpose of this study was to survey the state of the art of social studies education for the hearing impaired. Both public school day programs and residential programs were surveyed. Results of the study indicated that half of the sample programs taught little or no social studies. Teaching and evaluation strategies in programs teaching the social studies were infrequently modified to meet the needs and capabilities of the hearing impaired student. Analysis of curricula prior to selection may assist educators in selecting appropriate curricula. Curriculum development must follow analysis in order to provide effective social studies education for hearing impaired students.

Woolsey, M. L., Herring, T. J., & Satterfield, S. T. (2009) studied ***"Social Studies Instruction in Signing Programs for Deaf and Hard of Hearing Students: An Ecobehavioral Assessment".*** Social Studies is a devalued subject in public schools. Worse, apparently no research exists on social studies instruction for students in deaf education. The researchers investigated the allocation of time for social studies in 7 residential schools and 1 day school. Using an ecobehavioral assessment tool, they observed 30 deaf students (grades 3-5) and 17 teachers for 60 school days. Three questions guided the study: (a) How much time was used for social studies? (b) What activities were more prevalent during social studies instruction? (c) Were there differences in the target of teacher attention between high- and low-performing students? Results showed that yoking social studies and language arts resulted in a doubling of the amount of time devoted to social studies content. Hands-on activities were most prevalent across grades.

Sievers, Amanda (2005) studied ***"The social studies classroom: attitudes and perspective from the deaf and hard of hearing students through literature"*** Millions of children attend elementary, middle and high schools throughout the country to be instructed by teachers within six major subjects. Out of six main subjects taught in academic schools, social studies has been proven as one of the most difficult yet complex subjects among students especially the deaf and hard of hearing students. It has been noted where social studies, elaborate and diverse as it may be, have created an environment where most students have the tendency associate this subject with negative attitude and experiences. Critical factors contribute to the overall decline interest in socials studies such as lack of strong teacher to student relationship, the complexity of materials, and/or the constant repetition of old information. This thesis presents the overview of available literature reviews along with proposed research implementation for future studies based upon the information among deaf and hard of hearing students. With the help of these literature reviews based on the students and teachers in social studies, we can come to use this method of research to expand the new field of social studies within the deaf and hard of hearing group. With this meaningful information, we as professional can use the data to assist us in creating better and positive environment for the deaf and hard of hearing students within the social studies classroom.

2.14.0 Teaching Language to Students with Hearing Impairment

Domagała-Zyśk, E. (2015) studied ***"Teaching English as a Second Language to Deaf and Hard of Hearing Students".*** DHH students from non-English-speaking countries, like their hearing peers, often have to learn English as a foreign language in order to communicate in the field of education, work, and entertainment and to reach their true potential. As the major challenge of deafness is language fluency, and DHH persons often have problems using their national spoken/written languages, foreign language learning creates a new challenge for both deaf students and their teachers. This learning process is unique in two ways: (1) deafness or lack of hearing is, first of all, a language problem;(2) teaching languages differs from teaching other subjects. These two facts mean that the teaching and learning of foreign languages to DHH individuals is a specific and new domain within Deaf Studies that has to be recognized and researched.

Nisha, M., & Gill, J. C. R. studied ***"English Language Teaching Approaches to Deaf and Hard-of-Hearing Students in India".*** English language is an international language which is widely used all over the world those who speak other languages. As a language of education and career, it should be accessible to everyone in the word even marginalised. The target population of this paper is not only Deaf-and-Hard-Hearing (DHI) population, one of the marginalized categories in India, as a disabled class in the perspective of society, even if they are mentally strong and active, but also the whole education stream. There are various teaching approaches exclusively for DHH students. After 'Oralism', 'Bilingualism' is the widely accepted teaching approach in the field of deaf education. 'Total Communication' is a teaching approach which make use of the residual hearing and visual skills of hearing-impaired children along with sign language for instructing deaf students. So many controversies are still going on between bilingualism and total communication on its effectiveness and benefits. In these approaches, sign language is used as the first language of deaf students and English is the target language which is trained. Indian Sign Language (ISL) is the mother tongue of Indian deaf students. Still and all bilingualism or total communication is not as much flourished in India.

Goldberg, J. P., & Bordman, M. B. (1975) studied "***The ESL approach to teaching English to hearing-impaired students".*** This study compares the abilities of

hearing and hearing-impaired children to understand English words in print. Selecting words based on their relative occurrence in print, it was found, even for the most frequently occurring words, hearing-impaired children perform at a level considerably below that of their hearing peers. The implications of these findings for evaluating the linguistic competence of deaf children and for development of language curricula are discussed.

The success of the English language program at the Tutorial Center of Gallaudet College is due to the fact that it uses English-as-a-second-language methodology and not the methods of remedial English. As in all ESL classrooms, students who cannot yet express themselves adequately in English spend no time attempting to study grammar, learn rules of effective composition, or gain knowledge of subject matter in that language. Rather they spend time producing language in conformity with reliable models provided by the teacher. In adapting ESL methods to the needs of its students, the Tutorial Center has produced a variety of materials designed to impart not only a command of English forms but, more fundamentally, a grasp of the concepts expressed and when it is appropriate to express such concepts.

Moeller, M. P., Tomblin, J. B., Yoshinaga-Itano, C., Connor, C. M., & Jerger, S. (2007) conducted a study on "***Current state of knowledge: Language and literacy of children with hearing impairment".*** This study investigated the clinicians who work with children who are hard of hearing have always known that the earlier such children are given training, the better the outcome will be. The language development section synthesizes studies of semantics (vocabulary, novel word learning and conceptual categories), morphology, and syntax. The literacy section synthesizes studies of reading and writing, along with considering key constructs for understanding literacy and the potential effects of hearing impairment on literacy. Evidence regarding the timing of intervention is examined. The study also provides details in gaps in empirical knowledge to identify further research needs.

Delgado, G. L. (1981) studied **"*Hearing-impaired children from non-native language homes*".** A national survey was conducted to obtain basic demographic data and other characteristics of hearing-impaired children who come from home environments where the spoken language is unlike that used in the school. The results

indicate that there is a steady increase in the number of these children nationwide. A higher incidence of additional handicaps are reported for this group. Though educators express a deep concern for these children, relatively little was reported by way of accommodating their needs.

Svirsky, M. A., Robbins, A. M., Kirk, K. I., Pisoni, D. B., & Miyamoto, R. T. (2000) studied ***"Language development in children with profound and prelingual hearing loss, without cochlear implants".*** The paper discusses the poor reading achievement of hearing-impaired children. It identifies the two-way communication involved in the reading process and examines the linguistic competence of hearing-impaired children by tracing the language development of those born to deaf and hearing parents. It builds a case for defining and accepting American Sign Language as a separate and complete language from English. Implications for reading instruction are made based on research in bilingual education.

This study investigated the effect of several variables on the language development of children with profound and prelingual hearing loss who did not have cochlear implants, in order to generate a predictive model that could be used to estimate the improvements due to maturation and training. This model provides a useful benchmark that future studies will employ to determine whether the effect of cochlear implantation on language development exceeds the change in language development that would be expected from maturation and training alone.

2.15.0 Teaching Second Language to Students with Hearing Impairment

Geers, A. E., & Moog, J. S. (1987) studied ***"Predicting spoken language acquisition of profoundly hearing-impaired children".*** The Spoken Language Predictor (SLP) Index is a proposed guide for making recommendations regarding the most appropriate communication mode to be used in educating a given hearing-impaired child. The SLP Index is the sum of points obtained on five predictor factors that have been weighted according to their contribution to successful spoken language acquisition. The point values assigned for each factor as well as assignment of points to particular test scores within each factor was accomplished by subjective clinical judgment followed by trial application to actual clinic cases.

Three ranges of SLP indexes are associated with three educational recommendations: speech emphasis (SLP = 80-100), provisional speech instruction (SLP = 60-75), and sign language emphasis (SLP = 0-55). The purpose of this article is to describe the development and application of the SLP and preliminary evidence for its stability and validity.

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Bockmiller, P. R. (1981) studied **"*Hearing-impaired children: Learning to read a second language".*** The paper discusses the poor reading achievement of hearing-impaired children. It identifies the two-way communication involved in the reading process and examines the linguistic competence of hearing-impaired children by tracing the language development of those born to deaf and hearing parents. It builds a case for defining and accepting American Sign Language as a separate and complete language from English. Implications for reading instruction are made based on research in bilingual education.

J Philip Goldberg, Marcia B Bordman(1974) studied ***"English language instruction for the hearing impaired: An adaptation of ESL methodology".*** Writing samples show that hearing-impaired people who have reached adulthood without a command of English have the same difficulty in expressing themselves in English as

speakers of other languages in ESL classes. Notwithstanding years of previous instruction, these hearing-impaired students have continued to evidence severe English-language problems. We are convinced that they need ESL work and are offering such a program at the Tutorial Center of Gallaudet College. Because these students cannot hear and because they have problems not only with English structure but also with the concepts expressed, we have made two major modifications in ESL procedure: (1) Language practice is done in writing. (2) Practice at the mechanical stage is done with the addition of a step which forces the students to express the concept involved. Although these students encounter problems in using English outside the classroom, the intensive ESL work they receive when our program is offered in its ideal form has resulted in significant improvement in their control of English. We as well as the students themselves see from end-of-course writing samples that they have improved their control of English and do, indeed, have the ability to master it.

In the present paper the authors focus on their experience of teaching English as a foreign language to deaf and hard-of-hearing people. Teaching English to hearing-impaired people is an incredible challenge. Deaf and hard-of-hearing people have phonological difficulties, which affect not only their speaking and listening skills but they influence their way of retaining and expressing information, their organizational skills, their memory. The authors will point out the teaching methods and learning strategies which they find relevant in this specific classroom situation and that can help these people become aware of the culture of English speaking countries and also focus on the development of their reading and writing skills in the foreign language.

At first, the task of teaching a foreign language to a deaf student seems impossible. When we teach our students English as a foreign language we typically rely on oral teaching methods. Not only the material is delivered orally but students are tested by how they comprehend listening materials or how they respond orally during the lessons.

Drigas, A., Kouremenos, D., & Vrettaros, J. (2008) presented a study entitled "***Teaching of English to hearing impaired individuals whose mother***

language is the sign language". This article presents the results of consideration and study of the requirements for the level of professional training of a modern teacher, which allowed to develop a model for preparing a teacher for communicating with students with hearing impairments using foreign language tools and technology for its implementation, through visual materials. Schemes and diagrams illustrating grammar were used in different groups. The results were compared after the final control. Better efficiency was registered in the groups of adult men learners. University girls students showed much better understanding of the illustrated materials when sign models were used as the instrument of explanation. Young children have good memory but they do not have sufficient logical apparatus. Films and multimedia can be successfully used in groups of young learners but not complex models and schemes. They should be reserved for adults. University students can grasp the main idea of modeling in general and individual model construction. Models can help them to understand and memorize difficult grammar issues. Sign models illustrating grammar are the most useful teaching instrument for the university groups of hearing impaired students. Visual materials in teaching English to hearing impaired students are very important.

The teaching of the English language as a second language to deaf and hearing impaired individuals, whose mother language is the sign language, through the prism of the project 'Dedalos', is the main topic of this article. More particularly, a special e-learning platform was developed, which incorporated special pedagogic methods of distant linguistic training as well as innovative and high-quality educational e-content, suitably adapted to the needs of hearing impaired people through the use of contemporary animation and digital video technologies. In addition, audits and evaluation tests were incorporated within the platform, in order to assess and evaluate the linguistic skills of the hearing impaired students and the educational e-content was divided into various levels according to the educational level of each e-student. Both the evaluation process and the setting of the e-content to the appropriate level are achieved through the use of an intelligent taxonomy system.

Rao Parupalli Srinivas (2019) conducted a study on **"*The importance of teaching language skills to the second or foreign language learners of English: A comprehensive study"***. In the present competitive world, communication plays a vital

role in almost all the arenas. It becomes a barrier for people to communicate without learning a language. So, there is a need for people to learn a language in order to convey their thoughts and ideas to the other people all over the world. People need a common language to communicate internationally and English serves the purpose since it is the only language spoken all around the globe. First of all, to learn a foreign language, one must devote more time on it and do regular practice on all the four language skills such as listening, speaking, reading and writing. As classroom is the right place to practice all these skills, the teachers of English should understand the needs of the learners and try to implement various techniques, methods and approaches to improve the language skills of the foreign or second language learners. Moreover, the teachers should inspire the learners by following learner-centered approach in their classroom by adopting interesting and needful material to improve all the four skills of English. Since learning all the four skills of the English language is more essential for the learners to learn the language in a systematic way, the teachers should put more efforts on improving the standards of the learners.

Wang, Fengjuan (2010) conducted a study entitled ***"The Necessity of Grammar Teaching"***. Mastering grammar is the foundation in the proficiency of a language. Grammar teaching is also an essential part of language teaching. However, with the communicative approach was introduced into China, many foreign language teachers gradually make little of grammar teaching. In terms of the theory of linguistics, this paper specifically explores the status of grammar in language learning, the characteristics of foreign language learning, theoretical basis of communicative teaching approach, and the practical effect of ignoring grammar teaching to reposition grammar teaching for a comprehensive understanding of the necessity of teaching grammar.

Helena I. R. Agustien (2016) presented a study on **"*Teaching English Grammar in Asian Contexts"***. This chapter addresses the teaching of English grammar in Asian contexts. It argues that texts, rather than isolated sentences, should be used as a vehicle for teaching grammar. This is because texts provide meaningful and appropriate contexts of authentic language use. To elaborate on the concept of text, the systemic functional grammar tradition is adopted to present a perspective that teaching grammar does not always mean teaching the forms but also teaching the

meaning and function of grammar. This perspective is important because commercially available grammar books tend to mix the structural and functional labels of grammar in one sentence pattern causing confusion among Asian students especially regarding the 'verb' element. The verb functioning as the Finite of the clause is highlighted in the chapter since this seems to be a major source of grammatical mistakes. In the teaching strategies, presenting grammar in its form, meaning and use is suggested. With regard to 'use', this chapter advocates a 'one text many stories' strategy which originated from the reader-response theory in which the students are given the opportunities to use grammar creatively in the texts they create.

M Rahimi, M Pakzadian (2019) did a study on **"English Learners' Attitudes toward English as an International Language: A Qualitative Inquiry"**. This article reports on a qualitative study that investigated English learners' attitudes toward English as an International Language (EIL). Four major findings were identified in the current study. First, majority of the participants thought that English belongs to all its users, regardless of being its native speakers or not. Second, lack of knowledge of Outer Circle varieties led the students to stick to the two major Inner Circle varieties of English-American and British Englishes as standard norms. Third, majority of participants embraced localisation of English and considered it as a manifestation of local cultures. Furthermore, the learners admitted that their local government has attached great value to learning English, but they were concerned about the utilitarian view of education, since majority of the learners focus merely on obtaining high scores on English exams. Fourth, the learners expressed their dissatisfaction with the imbalanced contemporary English teaching and stated that developing communication competence should be the main goal of English instruction. Therefore, the authors suggest that effective measures be taken at policy making, materials development and pedagogy levels to promote the legitimacy of all varieties of English and meet the needs of today's English learners.

Geers, A. E., & Schick, B. (1988) studied "***Acquisition of spoken and signed English by hearing-impaired children of hearing-impaired or hearing parents".*** This study examines the degree to which hearing-impaired children of hearing-impaired parents (HIP) demonstrate an advantage in their acquisition of signed and spoken English over hearing-impaired children of hearing parents (HP). A subset

from the normative sample of the Grammatical Analysis of Elicited Language, 50 HIP children and 50 HP children, were matched in terms of their educational program, hearing level, and age. Results indicate that both groups had comparably poor expressive English language ability at 5 and 6 years of age. However, at age 7 and 8 HIP children demonstrated a significant linguistic advantage in both their spoken and signed English over HP children. Because the production of English by HIP children closely resembled that of orally educated hearing-impaired children of hearing parents, consistent language stimulation throughout the child's early years may be a critical factor in the development of English, regardless of the language or mode of expression.

Goldberg, J. P., & Bordman, M. B. (1975) studied ***"The ESL approach to teaching English to hearing-impaired students".*** The success of the English language program at the Tutorial Center of Gallaudet College is due to the fact that it uses English-as-a-second-language methodology and not the methods of remedial English. As in all ESL classrooms, students who cannot yet express themselves adequately in English spend no time attempting to study grammar, learn rules of effective composition, or gain knowledge of subject matter in that language. Rather they spend time producing language in conformity with reliable models provided by the teacher. In adapting ESL methods to the needs of its students, the Tutorial Center has produced a variety of materials designed to impart not only a command of English forms but, more fundamentally, a grasp of the concepts expressed and when it is appropriate to express such concepts.

2.16.0 Method of Teaching Second Language

SaadiahKummin, ShahlanSurat, FaridahMydinKutty, Zarina Othman, Nazri Muslim (2020) did a study on "***The Use of Multimodal Texts in Teaching English Language Oral Skills".*** The challenge of teaching English to Malaysian tertiary students has become more daunting considering the latest developments in technology. Teachers therefore face the challenges of having to deal with a majority of learners who not only have little confidence or competence in using English language but also lack analytical, critical and creative skills. Hence, teachers can overcome this problem by carrying out language activities that concentrate on the development of multiple literacy skills among learners. This article will demonstrate

specifically the ways in which the incorporation of multimodal materials will not only enhance students' English language competency but also their analytical and creative thinking skills. More specifically, the study utilizes the use of various multimodal texts as the teaching and learning approaches that include both auditory and visual modes encompassing video recording, YouTube videos, songs and Adobe voice. Additionally, within the multimodality framework, the students carried out a project in teams and explored authentic multimodal texts. Several interesting trends emerged based on the interpretation of the results. First, students were found to be more proactive and take ownership of their own learning processes. Second, learners were able to use the language in a more critical and creative manner due to the nature of the texts. Third, students were able to develop language learning skills both individually and in teams.

Yolageldili, Gulin; Arikan, Arda (2011) presented a study entitled ***"Effectiveness of Using Games in Teaching Grammar to Young Learners"***. The primary aim of this study was to explore the effectiveness of using games in teaching grammar to young learners from the view points of Turkish EFL teachers working in primary schools. English language teacher' (n = 15) opinions were collected through a questionnaire and the results of this study demonstrated that Turkish EFL teachers have a range of conceptions about using games in grammar teaching similar to those reported in the current literature. The study suggests that while Turkish EFL teachers accept the effectiveness of using games in grammar teaching, they do not use games as frequently as expected in their classrooms.

Yasemin Kırkgöz (2008) conducted a study entitled ***"A case study of teachers' implementation of curriculum innovation in English language teaching in Turkish primary education"***. This article reports a 2-year case study (2003-2005) on teachers' instructional practices, and the impact of teacher understandings and training upon the teachers' implementation of the Communicative Oriented Curriculum (COC) initiative in the context of a major curriculum innovation in teaching English to young learners in Turkish state schools. Using multidimensional qualitative research procedures, comprising classroom observations, teacher interviews and lesson transcripts, a picture is developed of how 32 teachers implemented COC. Results showed that teachers' instructional practices ranged along

the transmission and interpretation teaching continuum, and teachers' understandings and their prior training had an impact on the extent of their implementation of the curriculum initiative. The study highlights the need to provide continuous teacher training and teacher development opportunities, particularly during the critical first few years of the innovation process to promote the implementation of curriculum innovation in Turkish primary education.

Tsoneva, N. V., & Makrieva, I. N. (2012) studied "***Teaching English to people with hearing impairments".***The purpose of this study was to evaluate the teaching of the English language as a second language to deaf and hearing impaired individuals, whose mother language is the sign language, through the prism of the project 'Dedalos', is the main topic of this article. More particularly, a special e-learning platform was developed, which incorporated special pedagogic methods of distant linguistic training as well as innovative and high-quality educational e-content, suitably adapted to the needs of hearing impaired people through the use of contemporary animation and digital video technologies. In addition, audits and evaluation tests were incorporated within the platform, in order to assess and evaluate the linguistic skills of the hearing impaired students and the educational e-content was divided into various levels according to the educational level of each e-student. Both the evaluation process and the setting of the e-content to the appropriate level are achieved through the use of an intelligent taxonomy system.

In the present paper the authors focus on their experience of teaching English as a foreign language to deaf and hard-of-hearing people. Teaching English to hearing-impaired people is an incredible challenge. Deaf and hard-of-hearing people have phonological difficulties, which affect not only their speaking and listening skills but they influence their way of retaining and expressing information, their organizational skills, their memory. The authors will point out the teaching methods and learning strategies which they find relevant in this specific classroom situation and that can help these people become aware of the culture of English speaking countries and also focus on the development of their reading and writing skills in the foreign language.At first, the task of teaching a foreign language to a deaf student seems impossible. When we teach our students English as a foreign language we typically rely on oral teaching methods. Not only the material is delivered orally but

students are tested by how they comprehend listening materials or how they respond orally during the lessons.

Hadi, F. N., Wahyuni, D. S., & Sulistyawati, H. (2019) conducted a study entitled **"*Teacher's Strategies in Teaching English for The Hearing-Impaired Students*".** The authors focused on their experience of teaching English as a foreign language to deaf and hard-of-hearing people. Teaching English to hearing-impaired people is an incredible challenge. Deaf and hard-of-hearing people have phonological difficulties, which affect not only their speaking and listening skills but they influence their way of retaining and expressing information, their organizational skills, their memory. The authors will point out the teaching methods and learning strategies which they find relevant in this specific classroom situation and that can help these people become aware of the culture of English speaking countries and also focus on the development of their reading and writing skills in the foreign language. The study also reveals that the task of teaching a foreign language to a deaf student seems impossible. When we teach our students English as a foreign language we typically rely on oral teaching methods. Not only the material is delivered orally but students are tested by how they comprehend listening materials or how they respond orally during the lessons.

Sample involves hearing impaired students in senior high special education school. The study attempts to teach reading and writing for via new media, such as multimedia technology, smart cell phone, Ipad, wechat, Mooc, microblog, etc. which facilitates acquisition mode of hearing impaired students. The study constructs an interactive mode in which teacher teaches hearing impaired students English reading and writing through multimedia in class on-line and students learn English via smart cell phone, Ipad, wechat, Mooc, Microblog off-line. The online and offline class constitutes a whole learning mode for them. Through this mode, this paper puts forward some strategies and methods to train reading and writing competence for hearing impaired students.

Camargo, J., & Navarro, J. C. O. (2010) studied "***Exploring EFL students' reading comprehension process through their life experiences and the Sight Word Strategy*"**. Due to the role language and literature play in the construction of social,

economic and cultural systems, reading comprehension has become a growing challenge. This study examined how the relationship between English as a foreign language reading comprehension and life experiences while using the Sight Word Strategy could prove significant. Fifth graders at a public school in Bogotá participated in this study. Data were collected using tape recordings, field notes, archival data and students' reflections. Analysis indicated that comprehension and construction of meaning were generated by sharing life experiences and through the interaction produced in each one of the Sight Word Strategy stages. The study suggested further research into a more encompassing definition of reading comprehension and life experiences correlation as an appropriate goal for English as a foreign language.

There is at present no clear consensus as to the nature of the relations between oral vocabulary and specific literacy skills. The present study distinguished between vocabulary breadth and depth of vocabulary knowledge to better explain the role of oral vocabulary in various reading skills. A sample of 60 typically developing Grade 4 students was assessed on measures of receptive and expressive vocabulary breadth, depth of vocabulary knowledge, decoding, visual word recognition, and reading comprehension. Concurrent analyses revealed that each distinct reading skill was related to the vocabulary measures in a unique manner. Receptive vocabulary breadth was the only oral vocabulary variable that predicted decoding performance after controlling for age and nonverbal intelligence. In contrast, expressive vocabulary breadth predicted visual word recognition, whereas depth of vocabulary knowledge predicted reading comprehension. The results are discussed in terms of interrelations between phonological and semantic factors in the acquisition of distinct reading skills.

Ouellette, G. P. (2006) studied **"*What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension*".** There is at present no clear consensus as to the nature of the relations between oral vocabulary and specific literacy skills. The present study distinguished between vocabulary breadth and depth of vocabulary knowledge to better explain the role of oral vocabulary in various reading skills. A sample of 60 typically developing Grade 4 students was assessed on measures of receptive and expressive vocabulary breadth, depth of vocabulary knowledge, decoding, visual word recognition, and reading comprehension.

Concurrent analyses revealed that each distinct reading skill was related to the vocabulary measures in a unique manner. Receptive vocabulary breadth was the only oral vocabulary variable that predicted decoding performance after controlling for age and nonverbal intelligence. In contrast, expressive vocabulary breadth predicted visual word recognition, whereas depth of vocabulary knowledge predicted reading comprehension. The results are discussed in terms of interrelations between phonological and semantic factors in the acquisition of distinct reading skills.

2.17.0 Teaching Sight Words to Children

Blackwell, R., & Laman, S. (2013) did a study on ***"Strategies to teach sight words in an elementary classroom"***. The theoretical framework within which this article defines and describes the teaching of reading in early childhood education is derived from the work Ehri (1995). Ehri is professor of educational psychology at New York University. Professor Ehri describes four phases to the process of learning how to read. The four phases are pre-alphabetic, partial alphabetic, full alphabetic, and consolidated alphabetic (Ehri, 1995). Once the reader has gone through these four stages, they are then able to move forward towards fluency in reading by memorizing sight words. At the end of these processes the student will then be able to achieve literacy.

Aaron, P. G., Joshi, R. M., Ayotollah, M., Ellsberry, A., Henderson, J., & Lindsey, K. (1999) studied **"*Decoding and sight-word naming: Are they independent components of word recognition skill?"*** Word recognition skill is the foundation of the reading process. Word recognition could be accomplished by two major strategies: phonological decoding and sight-word reading, the latter being a marker for proficient reading. There is, however, a controversy regarding the relationship between decoding and sight-word reading, whether the two are independent or the latter is built on the foundations of the former. A related controversy about instructional strategy could be whether to use whole-word method to improve word recognition skills, or to first build decoding skills and then introduce sight words. Five goals were set up to address these issues: (a) developing a criterion that can be used easily by classroom teachers to assess sight-word reading ability, (b) examining this relationship between decoding and sight-word reading, (c) identifying

the mechanism that can explain the relationship, (d) examining factors that facilitate sight-word reading, and (e) discussing potential instructional implications of these findings. In order to accomplish these goals, naming time and word-naming accuracy of three groups of subjects (elementary school children, children identified as having reading disability, and college students) were studied by using a variety of verbal materials. The over-all conclusions are that the difference in naming time of letters and words can be used as a metric for assessing sight-word reading skill. Sight-word reading appears to be intimately related to decoding. Sight-word reading is accomplished by parallel processing of constituent letters of words and is influenced also by the semantic nature of words. It is conjectured that sight-word reading instruction is likely to be successful if decoding skills are firmly established first.

Due to the role language and literature play in the construction of social, economic and cultural systems, reading comprehension has become a growing challenge. This study examined how the relationship between English as a foreign language reading comprehension and life experiences while using the Sight Word Strategy could prove significant. Fifth graders at a public school in Bogotá participated in this study. Data were collected using tape recordings, field notes, archival data and students' reflections. Analysis indicated that comprehension and construction of meaning were generated by sharing life experiences and through the interaction produced in each one of the Sight Word Strategy stages. The study suggested further research into a more encompassing definition of reading comprehension and life experiences correlation as an appropriate goal for English as a foreign language.

Strauber, C. B., Sorcar, P., Howlett, C., & Goldman, S. (2020) studied ***"Using a picture-embedded method to support acquisition of sight words"***. This study investigated whether an intervention using words embedded with pictures can be more effective in sight word instruction than one using words alone. Participants included sixty-nine children in junior kindergarten (ages 4-5) enrolled in school in Ontario, Canada. Children were split randomly into treatment and control groups; the treatment group was taught four words using picture-embedded words, and the control group was taught using text alone. Both groups also received phonics instruction to support sight word acquisition. Children in the picture-embedded word

condition performed significantly higher than those in the word-alone condition on an immediate post-training test and later retention tests. This outcome, which contrasts with previous studies using picture-embedded words, may result from this method's use of a relevant linking phrase and action that help build an association between picture and word, as well as its incorporation of phonics instruction, with future work needed to test this hypothesis.

January, S. A. A., Lovelace, M. E., Foster, T. E., & Ardoin, S. P. (2017) studied ***"A comparison of two flashcard interventions for teaching sight words to early readers".*** Strategic Incremental Rehearsal (SIR) is a recently developed flashcard intervention that blends Traditional Drill with Incremental Rehearsal (IR) for teaching sight words. The initial study evaluating SIR found it was more effective than IR for teaching sight words to first-grade students. However, that study failed to assess efficiency, which is important to consider when evaluating and selecting interventions. Therefore, the current study evaluated both the efficiency and effectiveness of SIR compared with IR for teaching sight words to 4 general education students (3 in second grade and 1 in first grade) who were enrolled in 1 of 2 schools. An alternating treatments single-case design was used to compare the effects of SIR and IR interventions implemented 4 days per week across 4 or 5 weeks. Students' accuracy with words that were introduced during the week was assessed on Fridays, and maintenance of these words was assessed the following Friday. Results indicated that both interventions were effective for teaching students sight words, but that SIR was slightly more effective and efficient than IR for 3 of the 4 students. Findings have implications for the selection of flashcard interventions for teaching sight word vocabulary to early elementary students.

Bliss, S. L., Skinner, C. H., & Adams, R. (2006) studied "***Enhancing an English language learning fifth-grade student's sight-word reading with a time-delay taped-words intervention".*** A multiple-baseline design across word lists was used to investigate the effects of a modified taped-words intervention on Dolch word reading of a fifth-grade student who speaks English as a second language. The student completed a daily self-managed intervention in which he listened to lists of 30 sight-words while reading along, attempting to read the word before he heard it on the tape. As the word list was repeated, the word intervals were modified in accordance with

time-delay procedures. Across three lists of 30 words, immediate and steady gains in words read correctly within 3 s were found after the time-delay taped-words intervention was implemented. The student maintained words that he learned from previous lists once he was no longer listening to those tapes. The discussion calls attention to the need for the development and empirical validation of reading interventions for students who are English language learners and provides directions for future research.

Meadan, H., Stoner, J. B., & Parette, H. P. (2008) studied "***Sight Word Recognition among Young Children At-Risk: Picture-Supported vs. Word-Only".*** A quasi-experimental design was used to investigate the impact of Picture Communication Symbols (PCS) on sight word recognition by young children identified as "at risk" for academic and social-behavior difficulties. Ten pre-primer and 10 primer Dolch words were presented to 23 students in the intervention group and 8 students in the control group during interactive games. Assessments occurred at four points and results indicated that children in the control group learned sight words faster under similar conditions of activities and time. These findings are consistent with previous literature and offer further insight into the learning of sight words by this population. Interactive games proved effective with children; they learned quickly over a relatively short time exposure. In the last assessment (word and picture) the intervention group performed better than the control group, indicating that pictures assisted young children to identify and learn new words in a relatively short period of time.

Yaw, J. S., Skinner, C. H., Parkhurst, J., Taylor, C. M., Booher, J., & Chambers, K. (2011) studied "***Extending research on a computer-based sight-word reading intervention to a student with autism".*** A multiple-baseline design across tasks (i.e., word lists) was used to evaluate the effects of a computer-based sight-word reading intervention (CBSWRI) on the sight-word reading of a sixth-grade student with Autism. Across 3 lists of primer and first-grade Dolch words, the student showed immediate increases in sight-word reading after the CBSWRI was applied. As the student learned 25 words in 16 brief (i.e., 200 s) sessions, the efficiency and sustainability of the CBSWRI are discussed along with future research.

2.18.0 Teaching Sight Words to Hearing Impaired Children

Gallion, T. (2016) studied ***Improving vocabulary comprehension for deaf or hard of hearing students.*** The purpose of this study was to pursue the best ways to use visual representation as an introduction to vocabulary to a deaf or hard of hearing student. These techniques were effective for the student to be able to maintain comprehension. The teacher used either use sign language to demonstrate the sign for the vocabulary word or finger spell the vocabulary word, identified the written word, and said the word aloud in the study. The instrument used for the pretest and posttest were ten Dolch sight words: three, yellow, down, jump, help, run, funny, big, little and play. Documentation from the initial pretest was collected. Showing the sight words on flash cards for four days and provided a picture along with sign language used for 4 days and documented the outcomes. The results showed significant gains in Dolch sight word acquisition in favor of the flash card combined with picture and sign language.

Anderson, J. (2013) studied "***The effects of teaching multiple-meaning sight word vocabulary with pictures and visual prompts to Deaf children***". It is research study analyzed the effects of explicit instruction of multiple meaning vocabulary words using visual representations of sign language and pictures to increase reading comprehension skills for Deaf children. The goal of this project was to increase students' skills and strategies when decoding words with multiple meanings. The sample population consisted of three Deaf children, ages 10-11 years old, attending a Midwestern public school that has a Deaf Education program. This eight-week research study consisted of a four-week incidental instruction segment and second four-week segment when multiple-meaning sight words were taught with explicit instruction using visuals and picture prompts. The results of this study indicated that explicitly teaching multiple-meaning sight words with pictures and visual prompts positively impacted sight word recognition and reading comprehension skills for Deaf children.

Alghar bie, T. (2015) studied **"*Effects of a software program vs. constant time delay in the acquisition of sight words for a student with significant disabilities".*** The development of sight words is essential for individuals with significant disability. There is a plethora of research highlighting the acquisition of

sight words for this population but to date, most focus on teacher led interventions (Browder, Algrim-Delzell, Spooner, Mims, & Baker, 2009). This study investigated the use of computer technology vs. one-on-one instruction targeting sight words acquisition for a student with a significant disability. Results showed the participant indicated improved performance using the computer based intervention versus the constant time delay instructor led intervention.

Harrison, T. J. (2002) studied "***The development of a peer tutoring program to teach sight words to deaf elementary students".*** The purpose of this study was to examine the effectiveness of a peer tutoring program in teaching sight words to elementary students who are deaf. Prior research on specific peer tutoring programs such as The Peer Tutoring Model (Cooke, Heron, & Heward, 1963), Classwide Peer Tutoring (Arreaga-Mayer, 1998) and Peer-Assisted Learning (Fuchs, Fuchs, Mathes, & Simmons, 1997) has demonstrated that this instructional method actively engages students in learning and promotes mastery, accuracy, and fluency in content learning for hearing students with and without disabilities. However, there has been virtually no research investigating the full use of this technique with deaf children. Eight students from the Ohio State School for the Deaf were participants in this study. All students had a profound hearing loss and no additional disabilities. The participants were trained to implement the peer tutoring activity by the experimenter. A reciprocal tutoring model was used allowing each student to be both tutor and tutee. Data was collected on the number of peer tutoring steps completed by participants, end of the week and biweekly sight word tests, the number of learning trials per set of sight words and review tests. Generality measures included sentences and short stories containing the words the participant have learned during the study finally, student satisfaction concerning the use of peer tutoring was obtained in a questionnaire. Results showed deaf students could effectively implement a peer tutoring program. Participants demonstrated the ability to leam previously unknown sight words. Maintenance of words varied across the participants from a low of 38.9% of learned words maintained over time to a high of 85.7%. Generality of known words across posttest sentences was a high of 100% to a low of 42.1%. The scores on short stories ranged from 59.2 % to 85.9%. Typically, more skilled readers preformed better on review and generality assessments, than less skilled readers. However, both skilled and unskilled readers tended to score well on the end of the week test, with the

exception of two participants. Each of the participants said they were satisfied with the program and enjoyed peer tutoring.

Hayes, C. (2017) studied "***Measuring Success One (Sight) Syllable at a Time"***. Students with disabilities, like their economically disadvantaged counterparts, experience lower expectations and less demand for academic success from teachers. Students who experience both disabilities and social and economic disabilities may experience even less rigorous expectations from their teachers who experience only one condition or the other. Determined that this would not happen in his classroom, the author describes his experiences using the Edmark Reading Program (ERP), a program that develops sight reading skills for struggling readers. The author found this program particularly effective with children experiencing hearing loss. The visual supports that are available with the program help alleviate the challenges that children with hearing loss experience when learning to make sense of text. Instead of emphasizing phonics, the program focuses on recognizing words by sight.

Fossett, B., & Mirenda, P. (2006) studied **"*Sight word reading in children with developmental disabilities: A comparison of paired associate and picture-to-text matching instruction"***. Numerous instructional techniques have been used to teach sight word reading skills to individuals with developmental disabilities. The results of research incorporating paired associate instruction, in which familiar pictures are paired with unknown print stimuli, suggest that pictures "block" (i.e., interfere with) learners' ability to recognize novel text. On the other hand, there is some evidence that both stimulus fading and picture-to-text matching techniques can be used successfully to teach sight word recognition. Results indicated that the picture-to-text matching condition was more effective than the paired associate condition for developing a small sight word vocabulary. Follow-up data for one participant showed that skills developed using the picture-to-text matching strategy were maintained 4 months after intervention. Further research is necessary to extend these findings, particularly in terms of the development of larger sight word vocabularies and the transition from sight word reading to more conventional reading skills.

Ehri, L. C. (2014) studied "***Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning".*** Reading words may take several forms. Readers may utilize decoding, analogizing, or predicting to read unfamiliar words. Readers read familiar words by accessing them in memory, called sight word reading. With practice, all words come to be read automatically by sight, which is the most efficient, unobtrusive way to read words in text. The process of learning sight words involves forming connections between graphemes and phonemes to bond spellings of the words to their pronunciations and meanings in memory. The process is enabled by phonemic awareness and by knowledge of the alphabetic system, which functions as a powerful mnemonic to secure spellings in memory. Recent studies show that alphabetic knowledge enhances children's learning of new vocabulary words, and it influences their memory for doubled letters in words. Four phases characterize the course of development of sight word learning. The phases are distinguished according to the type of alphabetic knowledge used to form connections: pre-alphabetic, partial, full, and consolidated alphabetic phases. These processes appear to portray sight word learning in transparent as well as opaque writing systems.

Falk, J. L., Di Perri, K. A., Howerton-Fox, A., & Jezik, C. (2020) studied ***"Implications of a sight word intervention for deaf students".*** The effectiveness of a sight word intervention designed for Deaf students was investigated. Thirty students, grades 1-7, in an urban school for the Deaf received an 8-month intervention. A pretest/posttest design using a teacher-designed instrument, the Cumulative Bedrock Literacy Sight Word Assessment, and the Test of Silent Word Reading Fluency (Mather, Hammill, Allen, & Roberts, 2004) assessed increases in the number of sight words students could identify and the rate at which they could identify them. Paired-samples and independent-samples t tests and Pearson product-moment correlations were used to analyze data. Results indicated a significant increase in the number of sight words participants could identify positive intervention. Also, younger students increased their sight word vocabularies at a faster rate than older students. No significant differences based on home language or gender were found. The authors make suggestions for further research and program application.

Ehri, L. C. (2005) studied "Development of Sight Word Reading: Phases and Findings. The hallmark of skilled reading is the ability to read individual words accurately and quickly in isolation as well as in text, referred to as "context free" word reading skill (Stanovich, 1980). For a skilled reader, even a quick glance at a word activates its pronunciation and meaning. Being able to read words from memory by sight is valuable because it allows readers to focus their attention on constructing the meaning of the text while their eyes recognize individual words automatically. If readers have to stop and decode words, their reading is slowed down and their train of thought disrupted. This chapter examines theories and findings on the development of sight word reading.

2.19.0 Conclusion

The literature presented in this chapter gives a clear structure of the research done earlier and the important findings related to the study. A thorough review provided picture to the investigator to carry out the study.

CHAPTER III

METHODOLOGY

3.0 Introduction

The research methodology is a specific procedure or technique used to identify select, process and analyze information about a topic. In a research, the methodology section allows the reader to critically evaluate the overall validity and reliability of the study. There are many different methodologies used in various types of research and the term is usually considered to include research design, data gathering and data analysis. Methodology is the organized, hypothetical analysis of the methods applied to a field of study. The ultimate success of a research work generally depends upon the methods.

The present chapter outlines the Site description, Description of the sample, Sampling technique, Variables of the study, Design of the study, Construction of the tool, Data gathering procedure and Data analysis procedure.

Research as itself is a methodology that aims to identify, select, process, and analyze information on a particular research problem using appropriate techniques and procedures. Research methodology helps in systematically solving the research problem. The methodology is how the study is to be conducted. It refers to the design of the study through which the validity of results is to be established.

The methodology has an important role in any research as the reliability and validity of findings depend mostly on the methods used for the study. The present study is a quasi-experimental study that aimed to collect data to find out the effectiveness of multi modal intervention system in developing sight words among Children with Hearing Impairment at the primary level.

The methodology for the present study entitled **"Multimodal Intervention System for Developing Sight Words among Children with Hearing Impairment"** is discussed under the following headings:

3.1.0 Site description

3.2.0 Selection of the Sample

3.3.0 Distribution of the Sample

3.4.0 Design of the Study

3.5.0 Variables of the Study

3.6.0 Tool used in the Study

3.7.0 Pilot Study

3.8.0 Scoring Procedure

3.9.0 Implementation of the Study

3.10.0 Data Analysis

3.12.0 Conclusion

3.1 Site Description

The site selected for the study is two schools for children with Hearing Impairment in Calicut in the state of Kerala. They are:

1. Rotary School for the Hearing Impaired,Vatakara
2. Rahmaniya School for the Hearing Handicapped,Calicut

3.2 Selection of Sample

'Sample is a small proportion of a population selected for observation and analysis' (**Best & Khan, 2008**). A sample is a representative group taken from a population. Sampling is the process of taking the sample from a population. Based on the characteristics of the sample, results can be obtained about the characteristics of the population, in general.

In the present study, Stratified Random Sampling technique was adopted to select the sample. In statistics, stratified randomization is a method of sampling which first stratifies the whole study population into subgroups with same attributes or characteristics, known as strata, then followed by simple random sampling from the stratified groups, where each element within the same subgroup are selected unbiased during any stage of the sampling process, randomly and entirely by chance **(Nickolas & Steven, 2019).**

The description of the sample is given in the following table:

3.3 Distribution of the Sample

TABLE 3.1

STANDARD WISE DISTRIBUTION OF THE SAMPLE

S. No	Name of the School	Grade					Gender		Percentage in total		Total No. of Students (30)
		I	II	III	IV	V	M	F	M	F	
1.	Rahamaniya School for the Hearing Handicapped, Calicut	1	4	3	4	3	7	8	23	27	15
2.	Rotary School for the Hearing Impaired, Vadakara	2	3	4	3	3	9	6	30	20	15

The researcher identified 30 students, 15 students each from special and Inclusive schools for the present study. A total of 47% students are male and 53% students are female in Rahamaniya School for the Hearing Impaired. The sample consisted of 60% male and 40% female from Rotary School for the Hearing Impaired.

3.4. Design of the Study

In the present study, Quasi- experimental design was adopted. Due to scarcity of sample, the researcher followed Quasi- experimental study wherein Pre-observation and Post-observation was done besides treatment.

The layout of the design carried out in this study is given below.

P1 × P2

Here,

P1 indicates Pre- observation

P2 indicates Post-observation

× means Treatment (Multimodal Intervention)

3.5 Variables of the Study

Variable is a concept which can take on different quantitative values. For example: height, weight, income, age etc., A variable is a quantity which can vary from one individual to another. “Variable is a property that takes on different value” (Kerlinger, 2002). The variable selected and their level are given in the following table.

TABLE 3.1.0

VARIABLE AND THEIR LEVEL

Variable	Level
Independent Variable	
1. Age of the student	i. Group 1 - 7 to 9 years ii. Group 2- 10 to 12 years
2. Type of Disability	i. Group 1 -Hearing Impairment ii. Group 2- Hearing Impairment with associated disability
3. Gender	i. Group 1-Male ii. Group 2-Female
4. Class	i. Group 1- 1^{st} -3^{rd} ii. Group 2- 4^{th} to 5^{th}
5. Nature of Disability	i. Group 1- Conductive ii. Group 2- Sensory Neural iii. Group 3- Mixed
6. Parents with Hearing Impairment	i. Group 1- Yes ii. Group 2- No
7. Hearing Aid User	i. Group 1- Yes ii. Group 2- No
8. School	iii. Group 1- Rahamaniya School for the Hearing Handicapped iv. Group 2- Rotary School for the Hearing Impaired
9. Level of Disability	i. Group 1- Mild- Moderately Severe ii. Group 2- Severe-Profound
10. Cochlear Implanted student	i. Group 1- Yes ii. Group 2- No
11. Multi-modal Intervention (Indian Sign Language)	i. Finger spelling ii. Sign Language iii. Arm Tapping iv. Table Writing v. Air writing vi. See and Say vii. Usage of sight words
Dependent Variable	
1. Instruction in learning 26 English Alphabet(A-Z)	i. Performance in learning Alphabet
2. Instruction in learning 1-10 numerals	ii. Performance in learning Numerals
3. Multi-modal package for learning 11 sight words (And/The/For/They/She/ You/Said/His/But/On/In)	iii. Performance in learning Sight words
4. Application in content	iv. Performance in Usage of Sight words

3.6 Tools Used in the Study

1. **Personal Data Bank**

To collect general information regarding the participants and its details such as Gender, type of disability, Age of the student, Type of School, Cochlear Implant, Level of Disability ,Nature of Disability, Parents with Hearing Impairment, Hearing Aid User and Grade, personal data bank was developed.

2. Construction of the Tool for the study

i. Alphabet- The English Alphabet numbering 26 letters from A-Z were selected. Both capital and small letter alphabet were included in the study. Fingerspelling for each alphabet was included.
ii. Numeral- Numeral from 1-10 were included in the tool. Fingerspelling for each numeral was incorporated in the tool.
iii. Sight words- Eleven Sight words from the Dolch Kindergarten years category of sight words were selected. In the category, there are 40 sight words. From the group, only upto 4 letter sight words were selected. The kit comprises of 2 letter word (2), 3 letter word (7) and 4 letter word (2).

Thus in the list of vowels, there were 26 Alphabet, 10 Numerals and 11 sight words. Hence the total of 61 letters/ numerals/ sight words.

3.7.0 Pilot Study

Before conducting the pilot study, the tool constructed was given to the experts which includes Teacher educators in Special Education and Special teachers for students with Hearing Impairment. Based on their opinions and suggestions, certain modifications were made and then pilot study was administered.

For pilot study, 6 students from grade 1 to 5 were selected from Thanal Special School,Vatakara and Karuna Speech & Hearing HSS, Calicut.

Pretest, intervention and posttest were administered. The tool was found to be reliable to administer to the whole group as the Cronbach alpha is 0.88, indicating the tool is reliable.

3.8.0 Scoring Procedure

Scoring was done using 'Yes' or 'No' response. If the participant gives the correct response, 'one' score and for the incorrect response, 'zero' score.

3.9.0 Implementation of the Study

i. Pretesting

The pretesting was administered to each student separately. In the pretest, 26 Alphabet, 10 Numerals and 11 Sight words were given to the student to test their existing knowledge. Scoring was assigned as per procedure.

ii. Introduction of Multimodal Intervention Strategies (MMIS)

Multimodal Intervention Strategies (MMIS) includes seven strategies:

1. Fingerspelling
2. Sign language
3. Arm tapping
4. Table writing
5. Air writing
6. See and say
7. Usage of sight words in a sentence

1. Finger Spelling

Fingerspelling was the first step to introduce letters/ numerals/ sight words. Fingerspelling was taught both manually and also using video which has audio support. "Fingerspelling" is used to sign each letters of a word to engage students in learning the spelling along with the words. After introducing fingerspelling to letter and numeral, fingerspelling for sight words was introduced."Finger spelling" would usually take 10 minutes in a one hour class.

Fingerspelling is representation of alphabets or numbers using hands. While fingerspelling, the instructor must keep our hand above their shoulder but below the

chin. The elbow must be relaxed and close to their body. Hands should not move horizontally. It should be spelled as a total word rather than spelling out individual letters.

For example:- Fingerspelling for the sight word ‘and’ is shown in the video as given in below:

2. Sign Language

“Sign language” is a mode of communication used to teach any concept to the students with hearing impairment. After the sign for the particular sight word is shown, the concept is explained to the students using a sentence. Sign language uses non-verbal means to present an idea or feelings. This mode of communication is normally practised among hearing impaired community. It uses visual- manual modality to convey meaning.

The concept is explained to the students and provides examples on the various components.

It is a method of learning through signs. The video is played repeatedly for better retention of memory.“Sign language” takes 10 minutes in a one hour class

3. Arm Tapping

After the concept is explained the next step is to arm-tap the sight word which is the method that also integrates tactile learning. This method is used for students to learn spelling and on what letters should be written first. In this method, the child says the word and then spell out the letters of the word using their arm. It is a multi-sensory teaching approach. The child also needs to utter the word again at the last. This method usually takes 10 minutes in a one- hour class section.

4. Table Writing

It is an activity method of writing the sight words on a table. The students are shown the sight words in a video and simultaneously asked to write the sight words by looking at it. Then student is asked to write the sight words without looking at the sight words. This activity can be done after teaching the concept and takes 10 minutes in a one-hour class.

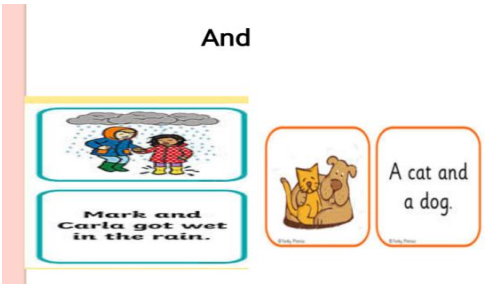
5. Air Writing

It is the method of writing a word freely in an open space in air. Air writing is the method to improve spatial awareness skills as well as tracking skills. The student is given the sight words at first which they are supposed to write in air by looking at the screen that shows the video of its spelling. Then, the student is encouraged to write by own. This technique usually takes 10 minutes in a one- hour class.

6. See and Say

When the student is taught to read word as a whole, looking at the print, the student learns to read words quickly. See and say is also found to be an effective way of teaching as it involves visual mode of learning. The students are given videos to track and trace the letters in the word by underlining it with her finger. The child is supposed to repeat the words all alone without any help, the second time. This method usually takes 15 minutes in a one- hour class.

7. Usage of Sight Words in a Sentence



At the end of the class the investigator rewinds the topic learned and the students are given a quick outlook of the topic learned through replay of the videos. It usually takes 25 minutes in a one-hour class.A test is conducted to check the sight words learnt.

Post Test

Using the same tool to identify the Impact of Multimodal Intervention, post test was conducted to the students for nearly 40 minutes and the responses were noted for knowing the effectiveness of Multimodal Intervention provided to the students. The post test was conducted in offline mode and the responses were evaluated. The mode of response for the collection of the data was liberal as they used oral, sign language and oral, Fingerspelling and Sign language.

3.10 Data Collection Procedure

The study was carried out in the following phases.

Phase I

Identify the Students with Hearing Impairment from grade 1 to 5 from the schools in Calicut. The Students with Hearing Impairment were identified by

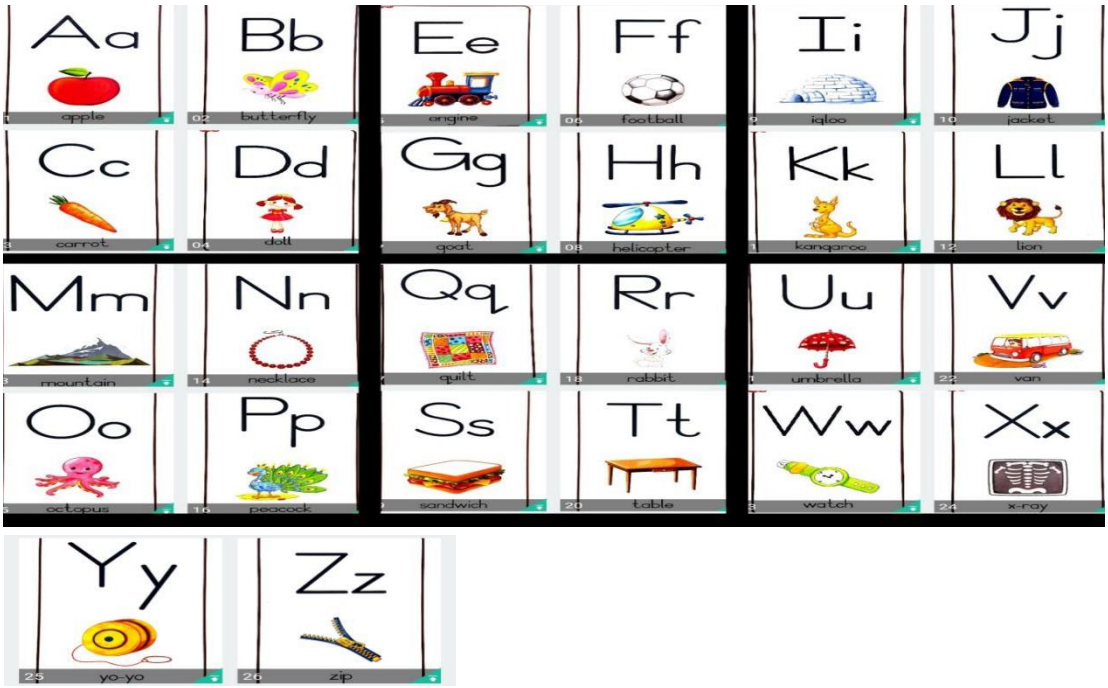
gathering information from teachers and also through the case profile from parents. Stratified Random sampling was taken.

Phase II

Pretesting was done to assess the understanding of sight words among selected sample. The tool was developed and used by the investigator on the 3 components of sight words using multi-modal intervention strategies including alphabets, numbers and sight words comprising of 26, 10 and 25 questions under each component respectively. The test was administered for 40 minutes to the Students with Hearing Impairment.

Phase III

Multimodal Intervention was given to the students on offline basis using videos through technology and additional resources like flashcards were given for further reference to children along with daily and weekly exercise. The time taken for this phase is 3 weeks, five sessions per week and thus total of 15 sessions with one hour for each session.



Phase IV

A post test was conducted using the same tool to measure the effectiveness in the scores of learning using the 11 sight words given using multimodal

intervention among the Students with Hearing Impairment before and after the Multimodal Intervention was given. The test was administered for 40 minutes to the Students with Hearing Impairment in each class.

3.11 Data Analysis

Data collected are tabulated on SPSS Data Variable for analysis. All data are used in nominal and are numerical for better understanding of the statistics. The coding is done based on deductive coding method. The method used is Independent t test and 2*2 factorial ANOVA. Frequency Analysis is also used for scoring and interpretation of the data. For comparison of independent and dependent variables, t test was used. To compare the effectiveness of Multimodal Intervention, 2*2 factorial ANOVA along with graphs were used.

3.12 Conclusion

The method, tools used, sampling procedures, variables selected and administration of tool have been clearly described in this chapter. The above methodology has been incorporated and the data has been statistically analyzed, tabulated, and consolidated in the following chapter called results and discussions.

CHAPTER IV

ANALYSIS AND INTERPRETATION

4.0 Introduction

The method followed in conducting the present study has been given in detail in the previous chapter. In this chapter the statistical techniques used for analyzing the data have been presented objective wise. The present chapter is devoted to the presentation of results and interpretation.

This has been done objective wise in the following captions.

Section I

Analysis of Distribution of sample based on the independent variables with graphs

i. Distribution of sample based on the independent variables
ii. Pictorial representation of Distribution of sample based on the independent variables with the use of graphs

Section II

Analysis of Overall scores Pretest and Posttest on acquisition of Alphabet, Numerals and Sight words

i. Analysis of Overall scores of Pretest and Posttest in Alphabets
ii. Analysis of Overall scores of Pretest and Posttest in Numerals
iii. Analysis of Overall scores of Pretest and Posttest in Sight words

Section III

T-test Analysis on Acquisition of scores in Alphabet, Numeral and Sight words with respect to Gender, Grade and Type of School both in the pretest and posttest among Students with Hearing Impairment

i. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Gender
ii. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Grade
iii. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Type of family
iv. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Gender
v. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Grade
vi. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Type of family
vii. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Gender
viii. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Grade
ix. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Type of family

Section IV

Repeated Measures of ANOVA) for the Performance of Students in scores of Alphabet, Numeral and Sight words in the pretest, intermediate test and posttest

i. Repeated Measures of ANOVA) for the Performance of Students in scores of Alphabet in the pretest, intermediate test and posttest.
ii. Repeated Measures of ANOVA) for the Performance of Students in scores of Numerals in the pretest, intermediate test and posttest.
iii. Repeated Measures of ANOVA) for the Performance of Students in scores of Sight words in the pretest, intermediate test and posttest.

Section V

Influence of Gender/Type of School and their resultant interaction on Alphabet, Numeral, and Sight words by analysis of 2*2 factorial ANOVA respectively.

i. Influence of Gender/Type of School and their resultant interaction on Alphabet
ii. Influence of Gender/Type of School and their resultant interaction on Numeral
iii. Influence of Gender/Type of School and their resultant interaction on Sight words.

Section I

4.1 Analysis of Distribution of sample based on the independent variables with graphs

i. Distribution of sample based on the independent variables is given in the table 4.1.1

Table 4.1.1 Distribution of sample Based on the Independent Variables

S. No	Independent Variables	Coding	No. of Students (N)	Percentage (%)
1.	Age	1. 7 to 9 years	12	40
		2. 10 to 12 years	18	60
2.	Gender	1. Male	16	53
		2. Female	14	47
3.	Grade	1. 1^{st} to 3^{rd}	17	57
		2. 4^{th} to 5^{th}	13	43
4.	Type of School	1. Special School	15	50
		2. Inclusive School	15	50
5.	Type of Disability	1. Hearing Impairment	23	77
		2. Hearing Impairment with Associated Disability	7	23
6.	Nature of Disability	1. Conductive	7	23
		2. Sensory Neural	22	73
		3. Mixed	1	4
7.	Level of Disability	1. Mild to Moderately Severe	10	34
		2. Severe to Profound	20	66
8.	Students with Hearing Impaired Parents	1. Yes	4	13
		2. No	26	87
9.	Students with Cochlear Implant	1. Yes	2	7
		2. No	28	93
10.	Use of Hearing Aid by the student	1. Yes	4	13
		2. No	26	87

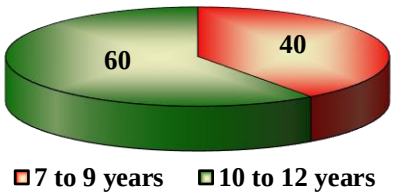
The table reveals that the students are of 7 to 12 years in age. Among the total population of 30, 40% of students fall under 7 to 9 years. We have 60% of the total students are of the age 10 to 11 years. The table also reveals that 53% of the students are male and 47% of the students are female. We can say that the number of males is greater than the number of females in the sample. It also reveals that 57% and 43% of the participants are from the 1st to 3rd grade and 4th to 5th grade respectively. There is an equal distribution of sample in both Special school and Inclusive school with 50% of participants each.

From the table, it is clear that 77% percentage of students have hearing impairment as disability alone which is higher than that of remaining 23% of the students who have Hearing Impairment with Associated Disability. The table reveals that 23% of the students have conductive hearing loss and 4% of the students have mixed hearing loss. It is also clear that, 73% of students are under sensory neural category of hearing loss. It is clear from the table that higher percentage of samples falls under the category of Severe to Profound hearing loss with almost 66% students. Around 34% of the students fall under Mild to Moderately Severe hearing loss category. The table shows us that almost 13% of the sample has parents who are Hearing Impaired. 87% students have parents with no Hearing Impairment forms the majority of the sample.

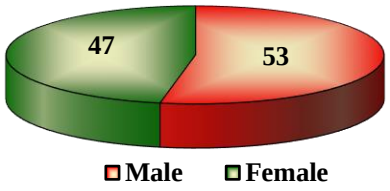
It shows us that almost 7% of the samples are students with cochlear implant. About 93% of the students have not done any cochlear implantation surgery. Thus they are the majority.The above table shows us that almost 13% of the samples are students without a hearing aid. About 87% of the students who are hearing aid users become the majority.

ii. **Pictorial representation of Distribution of sample based on the independent variables with the use of graphs**

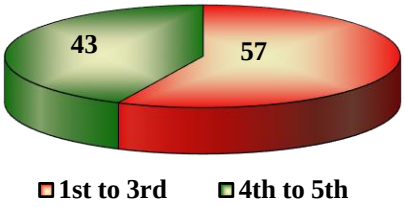
Age



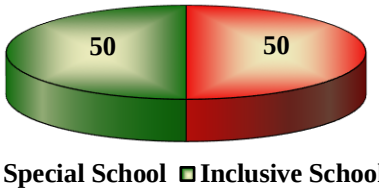
Gender



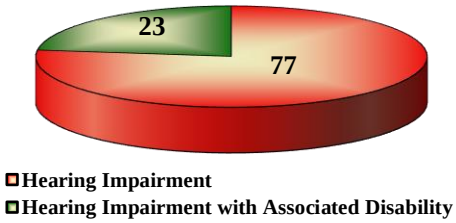
Grade



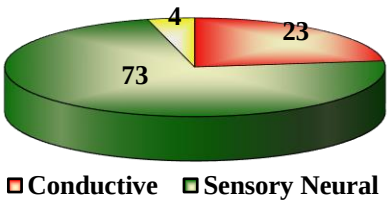
Type of School



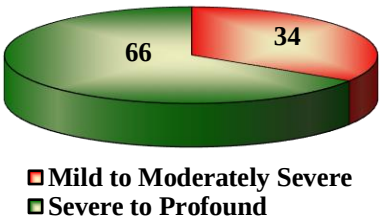
Type of Disability



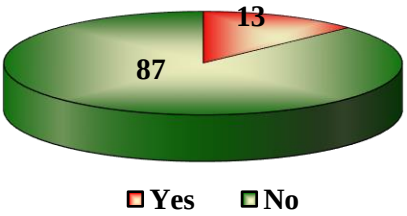
Nature of Disability



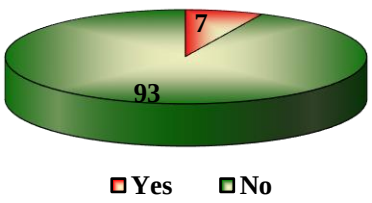
Level of Disability



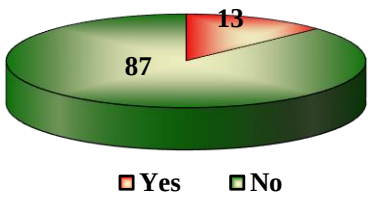
Students with Hearing Impaired Parents



Students with Cochlear Implant



Use of Hearing Aid by the student



Section II

4.2 Analysis of Overall scores Pretest and Posttest on acquisition of Alphabet, Numerals and Sight words

i. Analysis of Overall scores of Pretest and Posttest in Alphabets

Table 4.1.2 Testing wise Mean, S.D, df and t value for acquisition of Alphabets

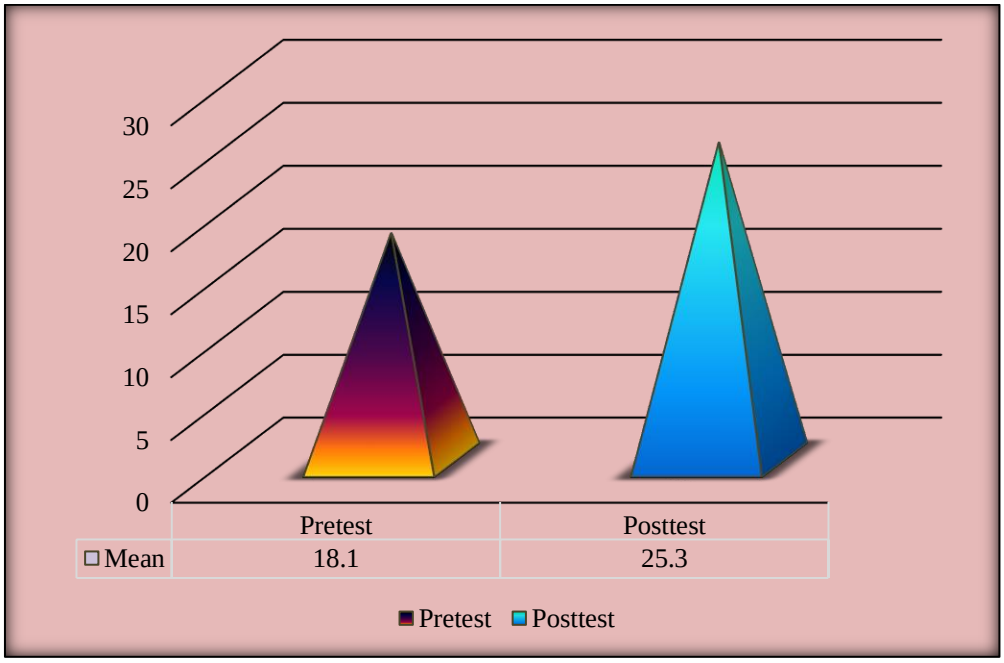
Alphabet	Mean	N	df	SD	Std. Error Mean	t value
Pretest	18.1	30	29	8.14	1.49	5.2**
Posttest	25.30	30	29	3.31	0.61	

****- Significant at 0.01 level**

From the table 4.1.2, it is evident that the t-value for scores on acquisition of Alphabet is 5.2 with df = 29 which is significant at 0.01 level. It indicates that pre and posttests score of Alphabet differ significantly. In the light of this, the null hypothesis that there is no significant difference in the scores for acquisition of Alphabet before and after Multimodal Intervention is rejected. It may therefore be concluded that Multimodal Intervention strategies helped in acquiring English Alphabet among children with Hearing Impairment.

Figure 4.1.1

Overall scores of Pretest and Posttest in Alphabets



ii. Analysis of Overall scores of Pretest and Posttest in Numeral

Table 4.1.3 Testing wise Mean, S.D, df and t value for acquisition of Numeral

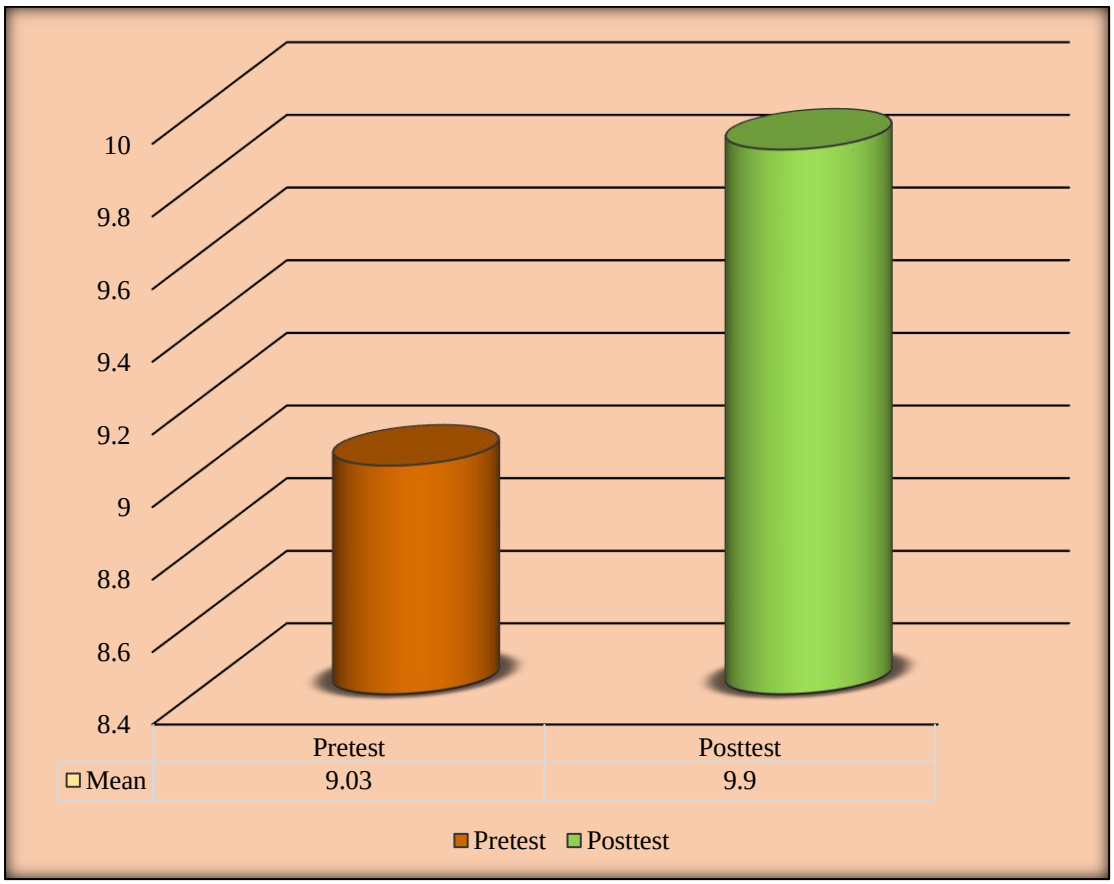
Numerals	**Mean**	**N**	**df**	**SD**	**Std. Error Mean**	**t value**
Pretest	9.03	30	29	2.37	0.43	2.25*
Posttest	9.90	30	29	0.55	0.10	

***- Significant at 0.05 level**

From the table 4.3, it is evident that the t-value for scores on acquisition of Numeral is 2.25 with df = 29 which is significant at 0.05 level. It indicates that pre and posttests score of Numeral differ significantly. In the light of this, the null hypothesis that there is no significant difference in the scores for acquisition of Numeral before and after Multimodal Intervention is rejected. It may therefore be concluded that Multimodal Intervention strategies helped in acquiring Numeral among children with Hearing Impairment.

Figure 4.1.2

Overall scores of Pretest and Posttest in Numeral



iii. Analysis of Overall scores of Pretest and Posttest in Sight words

Table 4.1.4 Testing wise Mean, S.D, df and t value for acquisition of Sight words

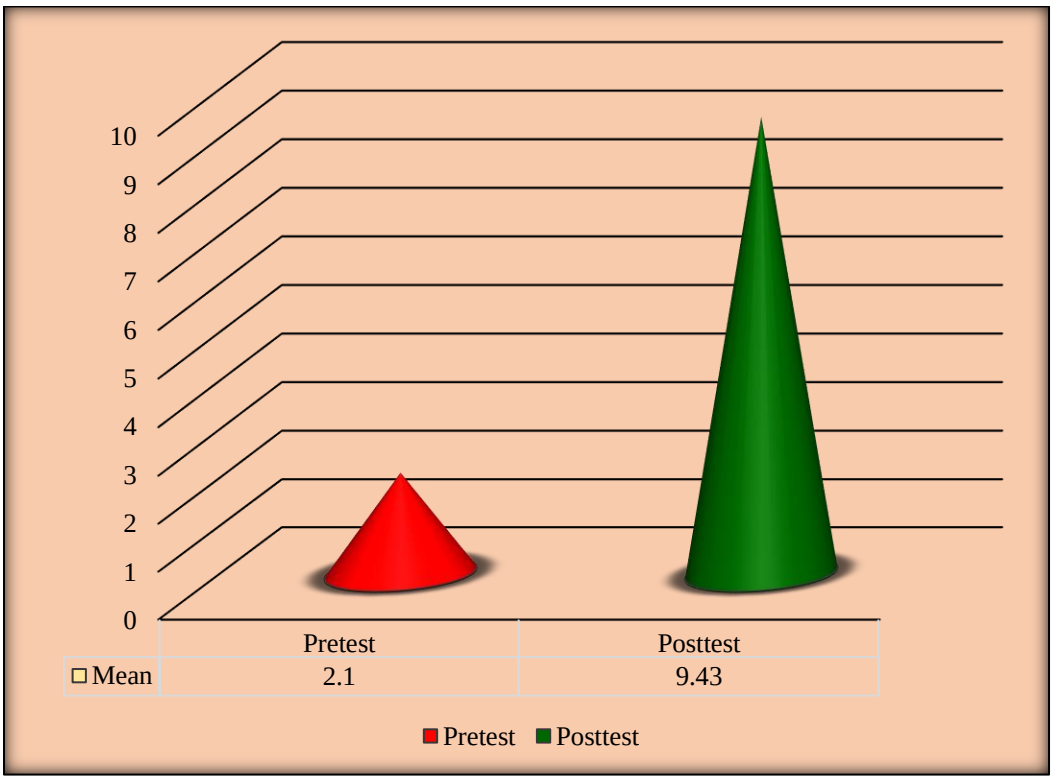
Sight words	Mean	N	df	SD	Std. Error Mean	t value
Pretest	2.10	30	29	1.37	0.25	16.18**
Posttest	9.43	30	29	2.21	0.40	

****- Significant at 0.01 level**

From the table 4.1.4, it is evident that the t-value for scores on acquisition of Sight words is 16.18 with df = 29 which is significant at 0.01 level. It indicates that pre and posttests score of Sight words differ significantly. In the light of this, the null hypothesis that there is no significant difference in the scores for acquisition of Sight words before and after Multimodal Intervention is rejected. It may therefore be concluded that Multimodal Intervention strategies helped in acquiring English Sight words among children with Hearing Impairment.

Figure 4.1.3

Overall scores of Pretest and Posttest in Sight words



Section III

4.3 T-test Analysis on Acquisition of scores in Alphabet, Numeral and Sight words with respect to Gender, Grade and Type of School both in the pretest and posttest among Students with Hearing Impairment

i. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Gender

Table 4.1.5 Testing wise Mean, S.D, df and t value for acquisition of scores in Alphabet with respect to Gender.

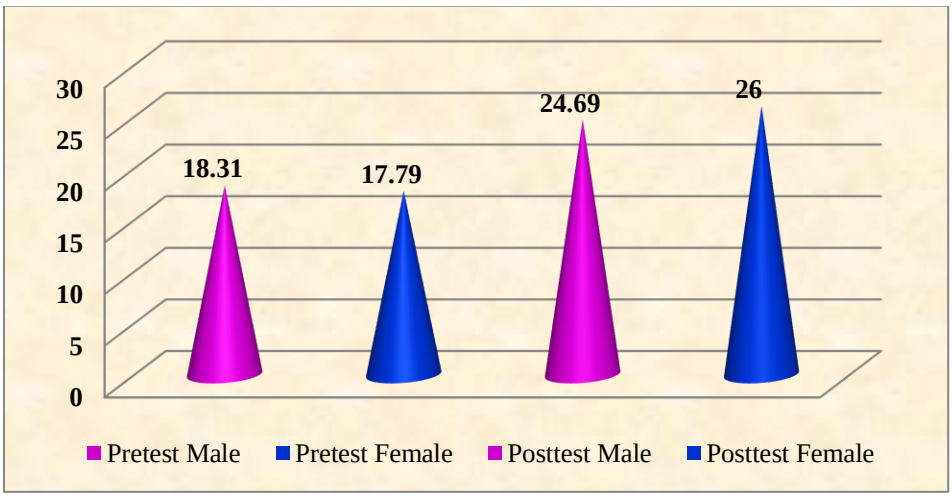
Alphabet	Gender	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Male	18.31	16	29	7.58	1.89	0.172_{NS}
	Female	17.79	14	29	9.01	2.41	
Posttest	Male	24.69	16	29	4.51	1.13	1.163_{NS}
	Female	26.00	14	29	0.00	0.00	

NS- Not Significant

From the table 4.1.5, On analyzing the pretest and posttest scores of Male and Female separately, the result indicates that the posttest scores of Male and Female were higher than pretest scores (Male) M= Pretest Mean 18.31; Posttest Mean=24.69, (Female) M= Pretest Mean 17.79; Posttest Mean=26.00) and thus indicating the effect of MMIS on learning English Alphabet.

Figure 4.1.4

Scores in pretest and posttest in Alphabet with respect to Gender



ii. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Grade

Table 4.1.6 Testing wise Mean, S.D, df and t value for acquisition of scores in Alphabet with respect to Grade.

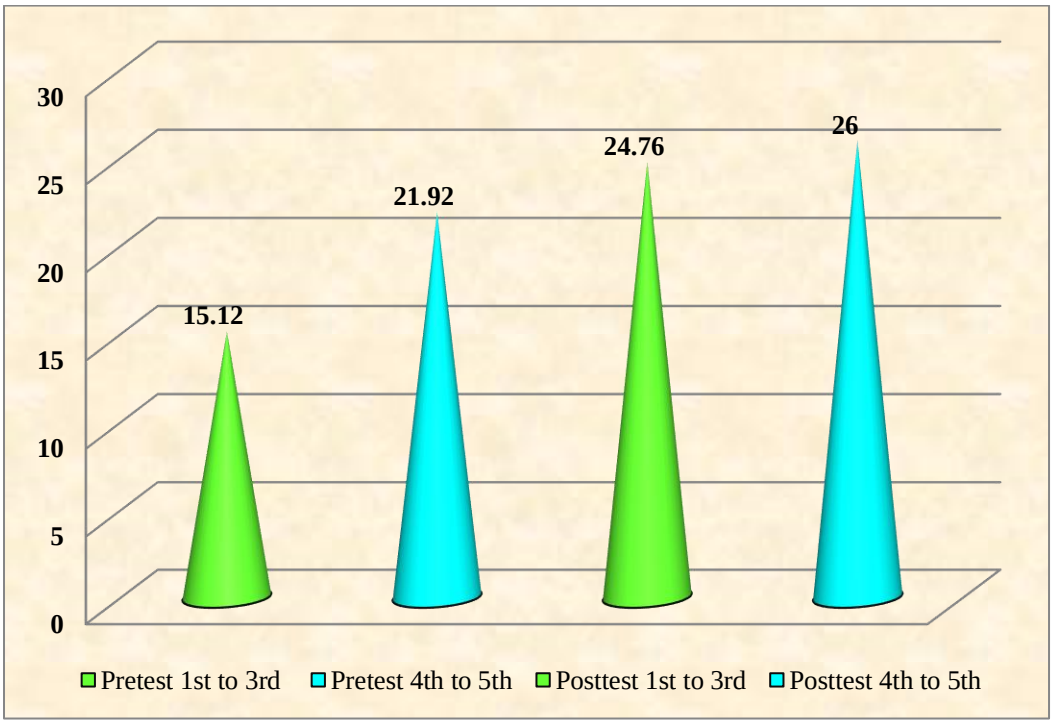
Alphabet	Grade	Mean	N	df	SD	Std. Error Mean	t value
Pretest	1st to 3rd	15.12	17	29	8.73	2.12	2.46*
	4th to 5th	21.92	13	29	5.47	1.52	
Posttest	1st to 3rd	24.76	17	29	4.38	1.06	1.16 NS
	4th to 5th	26.00	13	29	0.00	0.00	

***- Significant at 0.05 level NS- Not Significant**

From the table 4.1.6, On analyzing the pretest and posttest scores of 1st to 3rd grade and 4th to 5th grade separately, the result indicates that the posttest scores of 1st to 3rd grade and 4th to 5th grade were higher than pretest scores (1st to 3rd grade) M= Pretest Mean 15.12; Posttest Mean=24.76, (4th to 5th grade) M= Pretest Mean 21.92; Posttest Mean=26.00) and thus indicating the effect of MMIS on learning English Alphabet.

Figure 4.1.5

Scores in pretest and posttest in Alphabet with respect to Grade



iii. T- test Analysis on Acquisition of scores in pretest and posttest in Alphabet with respect to Type of school

Table 4.1.7 Testing wise Mean, S.D, df and t value for acquisition of scores in Alphabet with respect to Type of school.

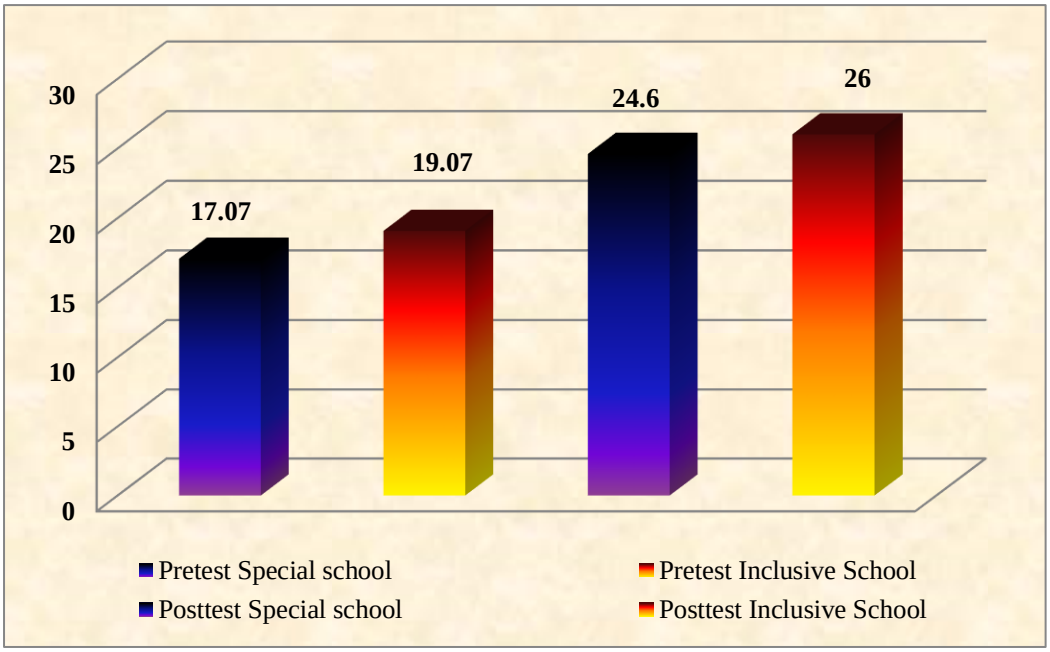
Alphabet	Type of School	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Special school	17.07	15	29	7.69	1.99	667^{NS}
	Inclusive School	19.07	15	29	8.71	2.25	
Posttest	Special school	24.60	15	29	4.66	1.20	1.164^{NS}
	Inclusive School	26.00	15	29	0.00	0.00	

NS- Not Significant

From the table 4.1.7, On analyzing the pretest and posttest scores of Special school and Inclusive School separately, the result indicates that the posttest scores of Special school and Inclusive School were higher than pretest scores (Special school) M= Pretest Mean 17.07; Posttest Mean=24.69, (Inclusive School) M= Pretest Mean 19.07; Posttest Mean=26.00) and thus indicating the effect of MMIS on learning English Alphabet.

Figure 4.1.6

Scores in pretest and posttest in Alphabet with respect to Type of school



iv. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Gender

Table 4.1.8 Testing wise Mean, S.D, df and t value for acquisition of scores in Numeral with respect to Gender.

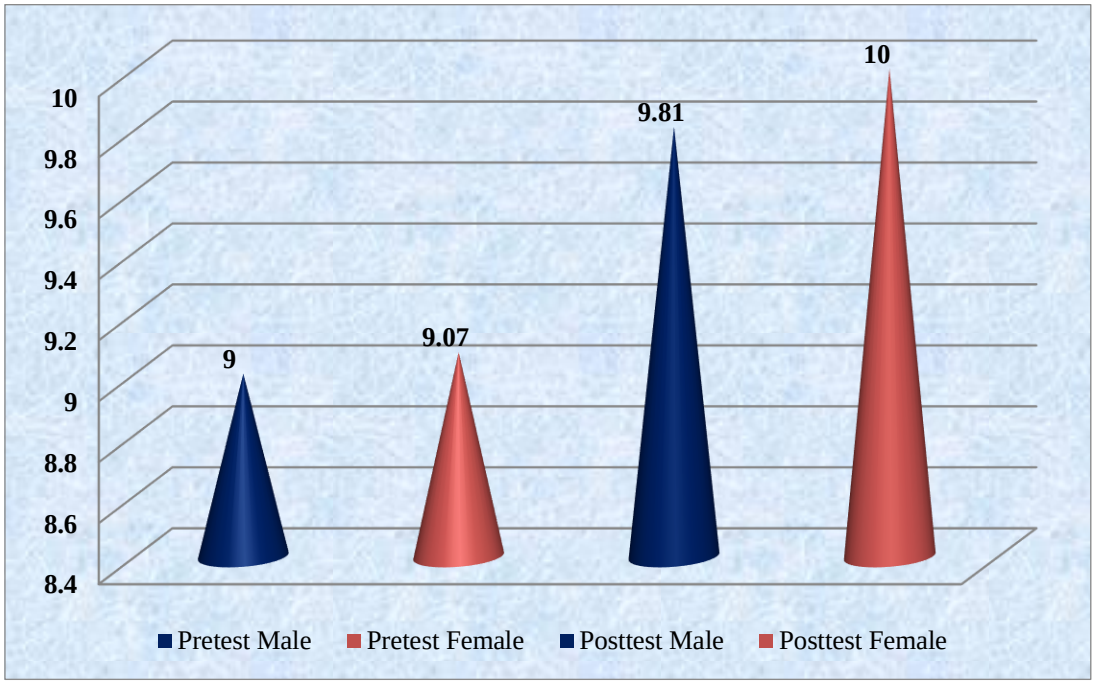
Numeral	Gender	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Male	9.00	16	28	2.56	0.64	0.82^{NS}
	Female	9.07	14	28	2.23	0.60	
Posttest	Male	9.81	16	28	0.75	0.19	1.00^{NS}
	Female	10.00	14	28	0.00	0.00	

NS- Not Significant

From the table 4.1.8, On analyzing the pretest and posttest scores of Male and Female separately, the result indicates that the posttest scores of Male and Female were higher than pretest scores (Male) M= Pretest Mean 9.00; Posttest Mean=9.81, (Female) M= Pretest Mean 9.07; Posttest Mean=10.00) and thus indicating the effect of MMIS on learning Numeral.

Figure 4.1.7

Scores in pretest and posttest in Numeral with respect to Gender



v. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Grade

Table 4.1.9 Testing wise Mean, S.D, df and t value for acquisition of scores in Numeral with respect to Grade.

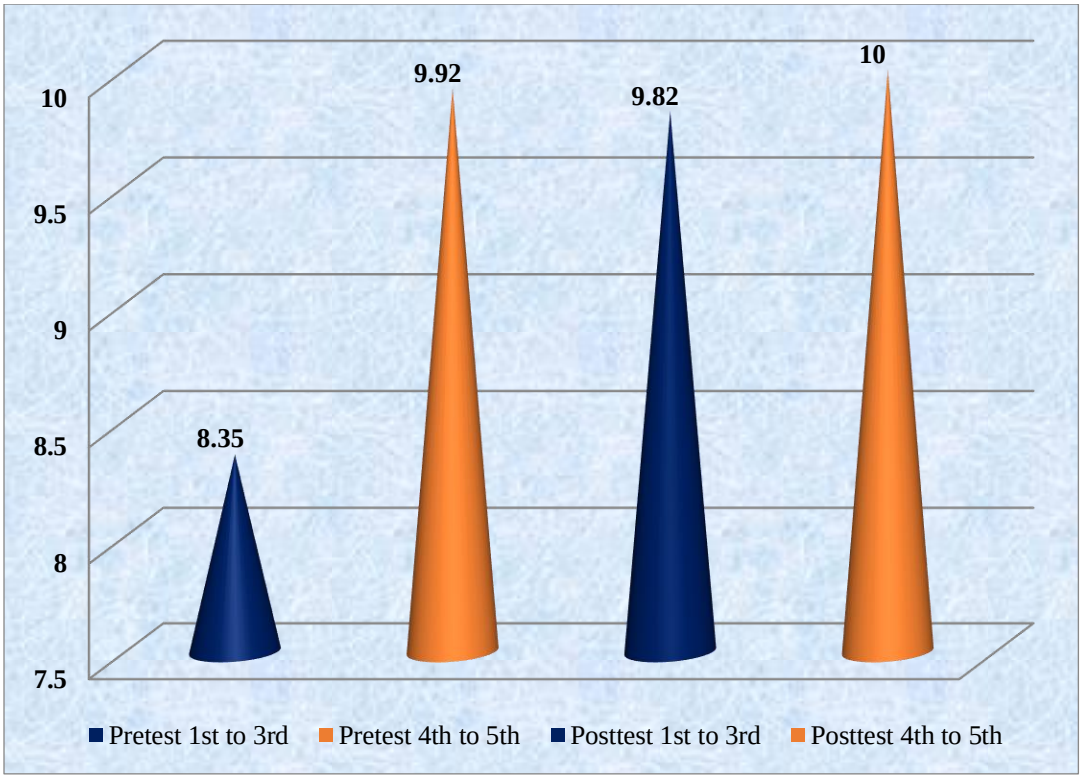
Numeral	Grade	Mean	N	df	SD	Std. Error Mean	t value
Pretest	1st to 3rd	8.35	17	28	3.00	0.73	2.15_{NS}
	4th to 5th	9.92	13	28	0.28	.077	
Posttest	1st to 3rd	9.82	17	28	0.73	0.18	1.00_{NS}
	4th to 5th	10.00	13	28	0.00	0.00	

NS- Not Significant

From the table 4.1.9, On analyzing the pretest and posttest scores of 1st to 3rd grade and 4th to 5th grade separately, the result indicates that the posttest scores of 1st to 3rd grade and 4th to 5th grade were higher than pretest scores (1st to 3rd grade) M= Pretest Mean 8.35; Posttest Mean=9.82, (4th to 5th grade) M= Pretest Mean 9.92; Posttest Mean=10.00) and thus indicating the effect of MMIS on learning Numeral.

Figure 4.1.8

Scores in pretest and posttest in Numeral with respect to Grade



vi. T- test Analysis on Acquisition of scores in pretest and posttest in Numeral with respect to Type of School

Table 4.2.0 Testing wise Mean, S.D, df and t value for acquisition of scores in Numeral with respect to Type of school.

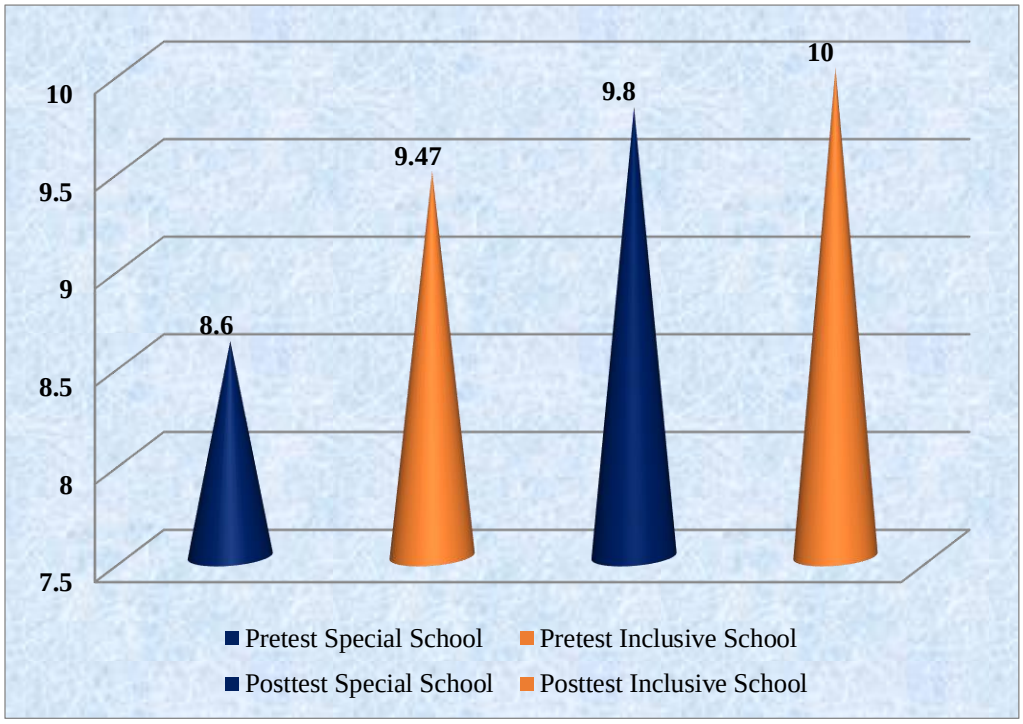
Numeral	Type of School	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Special School	8.60	15	28	2.64	0.68	1.00_{NS}
	Inclusive School	9.47	15	28	2.07	0.53	
Posttest	Special School	9.80	15	28	0.77	0.20	1.00_{NS}
	Inclusive School	10.00	15	28	0.00	0.00	

NS- Not Significant

From the table 4.2.0, On analyzing the pretest and posttest scores of Special school and Inclusive School separately, the result indicates that the posttest scores of Special school and Inclusive School were higher than pretest scores (Special school) M= Pretest Mean 8.60; Posttest Mean=9.80, (Inclusive School) M= Pretest Mean 9.47; Posttest Mean=10.00) and thus indicating the effect of MMIS on learning Numeral.

Figure 4.1.9

Scores in pretest and posttest in Numeral with respect to Type of School



vii. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Gender

Table 4.2.1 Testing wise Mean, S.D, df and t value for acquisition of scores in Sight words with respect to Gender.

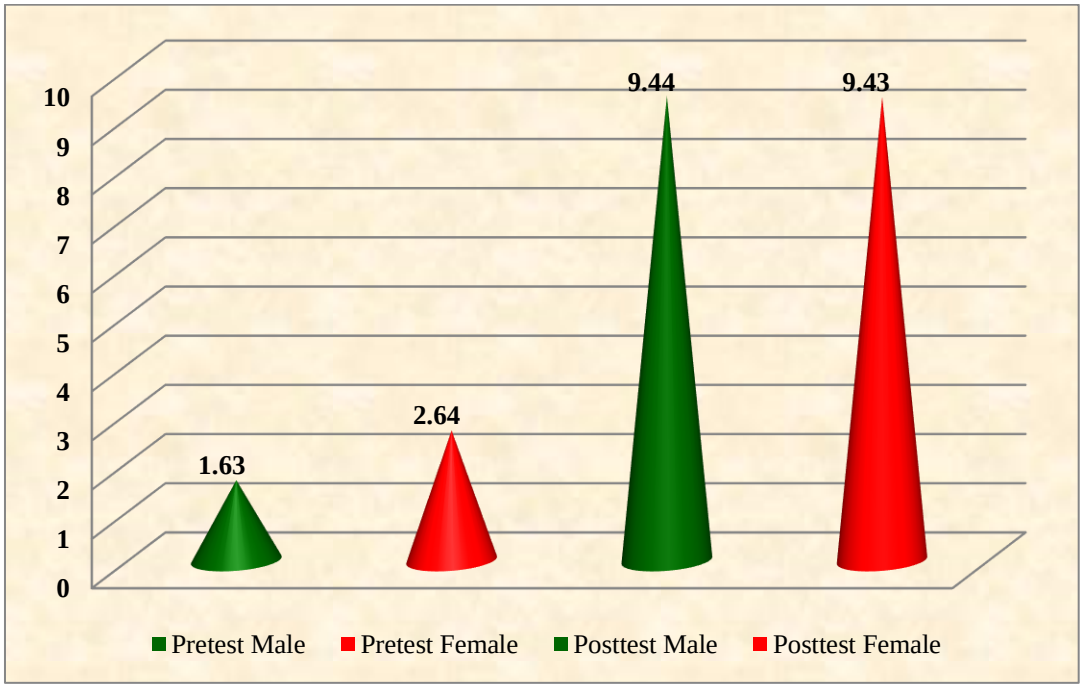
Sight words	Gender	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Male	1.63	16	28	0.62	0.15	2.148*
	Female	2.64	14	28	1.78	0.48	
Posttest	Male	9.44	16	28	2.58	0.65	$.011_{NS}$
	Female	9.43	14	28	1.79	0.48	

***Significant at 0.05 level NS- Not Significant**

From the table 4.2.1, On analyzing the pretest and posttest scores of Male and Female separately, the result indicates that the posttest scores of Male and Female were higher than pretest scores (Male) M= Pretest Mean 1.63; Posttest Mean=9.44, (Female) M= Pretest Mean 2.64; Posttest Mean=9.43) and thus indicating the effect of MMIS on learning Sight words.

Figure 4.2.0

Scores in pretest and posttest in Sight words with respect to Gender



viii. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Grade

Table 4.2.2 Testing wise Mean, S.D, df and t value for acquisition of scores in Sight words with respect to Grade

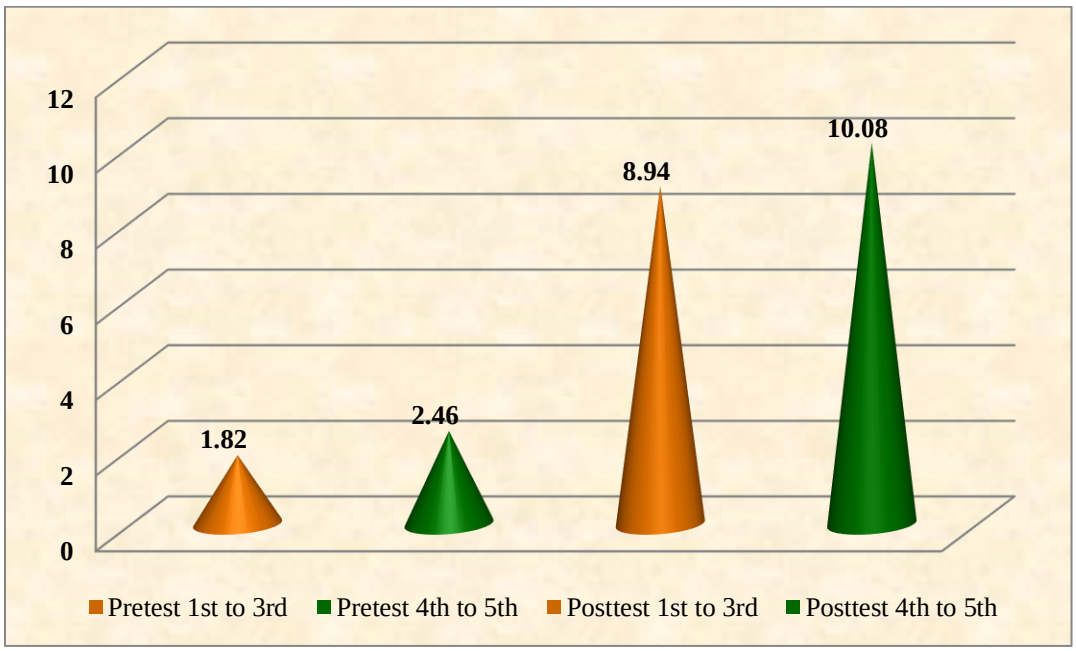
Sight words	Grade	Mean	N	df	SD	Std. Error Mean	t value
Pretest	1st to 3rd	1.82	17	28	0.73	0.18	1.15_{NS}
	4th to 5th	2.46	13	28	1.90	0.53	
Posttest	1st to 3rd	8.94	17	28	2.66	0.64	1.55_{NS}
	4th to 5th	10.08	13	28	1.26	0.35	

NS- Not Significant

From the table 4.2.2, On analyzing the pretest and posttest scores of 1st to 3rd grade and 4th to 5th grade separately, the result indicates that the posttest scores of 1st to 3rd grade and 4th to 5th grade were higher than pretest scores (1st to 3rd grade) M= Pretest Mean 1.82; Posttest Mean=8.94, (4th to 5th grade) M= Pretest Mean 2.46; Posttest Mean=10.08) and thus indicating the effect of MMIS on learning Sight words.

Figure 4.2.1

Scores in pretest and posttest in Sight words with respect to Grade



ix. T- test Analysis on Acquisition of scores in pretest and posttest in Sight words with respect to Type of School

Table 4.2.3 Testing wise Mean, S.D, df and t value for acquisition of scores in Sight words with respect to Type of School

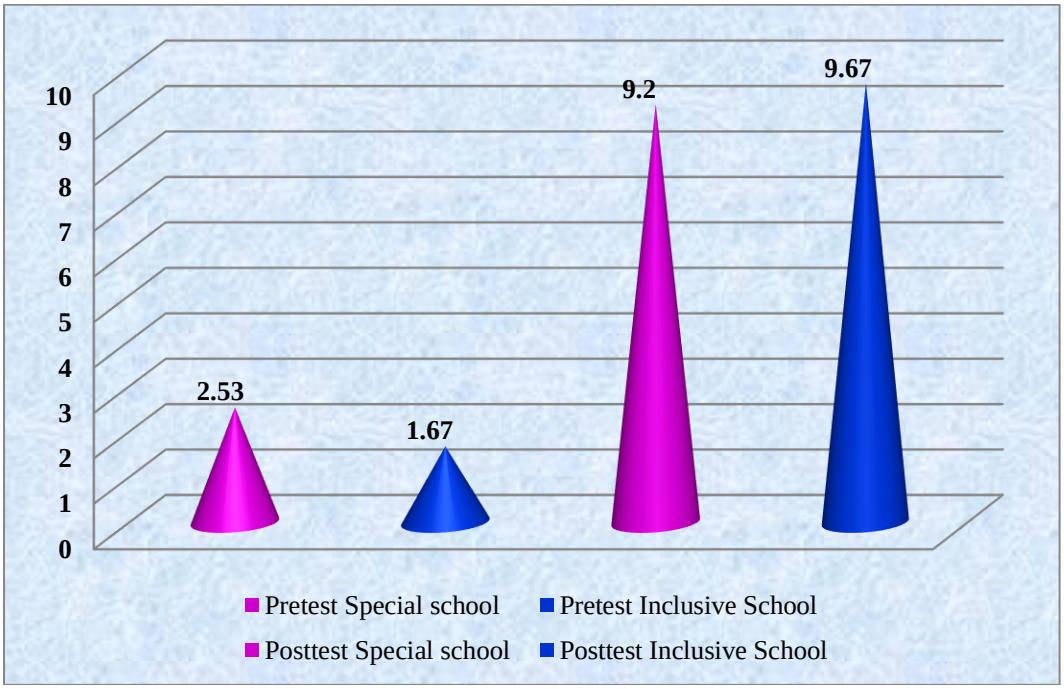
Sight words	Type of School	Mean	N	df	SD	Std. Error Mean	t value
Pretest	Special school	2.53	15	28	1.64	0.42	1.79_{NS}
	Inclusive School	1.67	15	28	0.90	0.23	
Posttest	Special school	9.20	15	28	2.70	0.70	0.57_{NS}
	Inclusive School	9.67	15	28	1.63	0.42	

NS- Not Significant

From the table 4.2.3, On analyzing the pretest and posttest scores of Special school and Inclusive School separately, the result indicates that the posttest scores of Special school and Inclusive School were higher than pretest scores (Special school) M= Pretest Mean 2.53; Posttest Mean=9.20, (Inclusive School) M= Pretest Mean 1.67; Posttest Mean=9.67) and thus indicating the effect of MMIS on learning Sight words.

Figure 4.2.2

Scores in pretest and posttest in Sight words with respect to Type of School



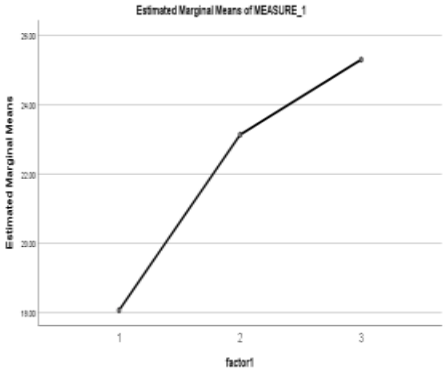
Section IV

4.4 Repeated Measures of ANOVA) for the Performance of Students in scores of Alphabet, Numeral and Sight words in the pretest, intermediate test and posttest

i. Repeated Measures of ANOVA) for the Performance of Students in scores of Alphabet in the pretest, intermediate test and posttest.

Table 4.2.4 Summary of Repeated Measures ANOVA for the Performance of Students in scores of Alphabet in the pretest, intermediate test and posttest.

Alphabet	Mean	SD	N
Pretest	18.07	8.14	30
Intermediate test	23.13	5.27	30
Posttest	25.30	3.31	30



Source of Variance		Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Alphabet-Pretest, Intermediate test, Posttest	Sphericity Assumed	826.87	2	413.43	24.46	0.00	0.46
	Greenhouse-Geisser	826.87	1.30	635.15	24.46	0.00	0.46
	Huynh-Feldt	826.87	1.34	618.06	24.46	0.00	0.46
	Lower-bound	826.87	1.00	826.87	24.46	0.00	0.46
Error (Alphabet - Pretest, Intermediate test, Posttest)	Sphericity Assumed	980.47	58	16.91			
	Greenhouse-Geisser	980.47	37.75	25.97			
	Huynh-Feldt	980.47	38.80	25.27			
	Lower-bound	980.47	29.00	33.81			

****- Significant at 0.01 level**

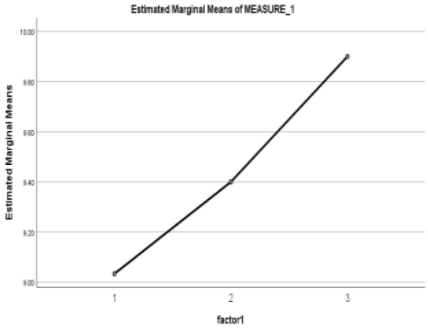
From the table 4.2.4, it is evident that the F value for overall performance is (2, 1.30) = 24.46, $p<0.01$). This shows that Mean of overall scores in the Pretest, Intermediate test and Posttest differs significantly. The effect size $\eta 2 = 0.46$ was found to be significant in making changes as the result of the intervention. In the context the null hypothesis stated as that there is no significant difference within Performance of

Students in scores of Alphabet in the Pretest, Intermediate test and posttest scores is rejected.

ii. Repeated Measures of ANOVA) for the Performance of Students in scores of Numerals in the pretest, intermediate test and posttest.

Table 4.2.5 Summary of Repeated Measures ANOVA for the Performance of Students in scores of Numerals in the pretest, intermediate test and posttest.

Numerals	Mean	SD	N
Pretest	9.03	2.37	30
Intermediate test	9.40	1.73	30
Posttest	9.90	0.55	30



Source of variance		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Numerals-Pretest, Intermediate test, Posttest	Sphericity Assumed	11.36	2	5.68	4.66	0.01	0.14
	Greenhouse-Geisser	11.36	1.10	10.37	4.66	0.04	0.14
	Huynh-Feldt	11.36	1.11	10.27	4.66	0.04	0.14
	Lower-bound	11.36	1.00	11.36	4.66	0.04	0.14
Error (Numerals - Pretest, Intermediate test, Posttest)	Sphericity Assumed	70.64	58	1.22			
	Greenhouse-Geisser	70.64	31.77	2.22			
	Huynh-Feldt	70.64	32.07	2.20			
	Lower-bound	70.64	29.00	2.44			

*** Significant at 0.05 level**

From the table 4.2.5, it is evident that the F value for overall performance is (2, 1.10) = 4.66, $p<0.05$). This shows that Mean of overall scores in the Pretest, Intermediate test and Posttest differs significantly. The effect size $\eta 2 = 0.14$ was found to be significant in making changes as the result of the intervention. In the context the

null hypothesis stated as that there is no significant difference within Performance of Students in scores of Numerals in the Pretest, Intermediate test and posttest scores is rejected.

iii. Repeated Measures of ANOVA) for the Performance of Students in scores of Sight words in the pretest, intermediate test and posttest.

Table 4.2.6 Summary of Repeated Measures ANOVA for the Performance of Students in scores of Sight words in the pretest, intermediate test and posttest.

SightWords	Mean	SD	N
Pretest	2.10	1.37	30
Intermediate	4.77	1.61	30
Posttest	9.43	2.21	30

Source of variance		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Sight words-Pretest, Inter-mediate test, Posttest	Sphericity Assumed	826.67	2	413.33	183.47	0.00	0.86
	Greenhouse-Geisser	826.67	1.73	477.37	183.47	0.00	0.86
	Huynh-Feldt	826.67	1.83	451.28	183.47	0.00	0.86
	Lower-bound	826.67	1.00	826.67	183.47	0.00	0.86
Error (Sight words-Pretest, Inter-mediate test, Posttest)	Sphericity Assumed	130.67	58	2.25			
	Greenhouse-Geisser	130.67	50.22	2.60			
	Huynh-Feldt	130.67	53.12	2.46			
	Lower-bound	130.67	29.00	4.51			

***Significant at 0.05 level**

From the table 4.2.6, it is evident that the F value for overall performance of Students in scores of Sight words in the pretest, intermediate test and posttest is(2, 1.73) = 183.47, $p<0.05$). This shows that Mean of overall scores of Sight words in the Pretest, Intermediate test and Posttest differs significantly. The effect size $\eta 2 = 0.86$

was found to be significant in making changes as the result of the intervention. In the context the null hypothesis stated as that there is no significant difference within Performance of Students in scores of Sight words in the Pretest, Intermediate test and posttest scores is rejected. It means the Multimodal Intervention was effective in teaching Sight words.

Section V

4.5 Influence of Gender/Type of School and their resultant interaction on Alphabet, Numeral, and Sight words by analysis of 2*2 Factorial ANOVA.

i. Influence of Gender/Type of School and their resultant interaction on Alphabet

Table 4.2.7 Summary of Analysis of 2*2 Factorial ANOVA for the Performance of Students in scores of Alphabet in interaction with Gender/Type of School.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	34.30[a]	3	11.43	1.05	0.39
Intercept	18943.27	1	18943.27	1734.24	0.00
Gender	9.98	1	9.98	0.91	0.35
SchoolType	9.98	1	9.98	0.91	0.35
Gender *SchoolType	9.98	1	9.98	0.91	0.35
Error	284.00	26	10.92		
Total	19521.00	30			
Corrected Total	318.30	29			

From the table 4.2.7, it is evident that the F value for overall performance of Students in scores of Alphabet in the interaction with Gender/Type of School is 1.05 which is significant at the 0.05 level. This means the null hypothesis that there is no significant difference for the Performance of Students in scores of Alphabet in interaction with Gender/Type of School is rejected.

i. Influence of Gender/Type of School and their resultant interaction on Numeral

Table 4.2.8 Summary of Analysis of 2*2 Factorial ANOVA for the Performance of Students in scores of Numerals in interaction with Gender/Type of School.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	0.70[a]	3	0.23	0.76	0.53
Intercept	2883.70	1	2883.70	9372.01	0.00
Gender	0.20	1	0.20	0.66	0.42
SchoolType	0.20	1	0.20	0.66	0.42
Gender * SchoolType	0.20	1	0.20	0.66	0.42
Error	8.00	26	0.31		
Total	2949.00	30			
Corrected Total	8.70	29			

From the table 4.2.8, it is evident that the F value for overall performance of Students in scores of Numerals in the interaction with Gender/Type of School is 0.76 which is slightly significant at the 0.05 level. This means the null hypothesis that there is no significant difference for the Performance of Students in scores of Alphabet in interaction with Gender/Type of School is rejected.

ii. Influence of Gender/Type of School and their resultant interaction on Sight words.

Table 4.2.9 Summary of Analysis of 2*2 Factorial ANOVA for the Performance of Students in scores of Sight words in interaction with Gender/Type of School.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.00[a]	3	1.33	0.25	0.86
Intercept	2629.08	1	2629.08	497.59	0.00
Gender	0.03	1	0.03	0.01	0.94
SchoolType	1.40	1	1.40	0.27	0.61
Gender * SchoolType	2.32	1	2.32	0.44	0.51
Error	137.38	26	5.28		
Total	2811.00	30			
Corrected Total	141.37	29			

From the table 4.2.9, it is evident that the F value for overall performance of Students in scores of Sight words in the interaction with Gender/Type of School is 0.25 which is not significant at the 0.01 level. This means the null hypothesis that there is no significant difference for the Performance of Students in scores of Alphabet in interaction with Gender/Type of School is accepted.

4.6.0 Conclusion

The findings of the study are summarized and presented in the next chapter.

CHAPTER V
SUMMARY AND CONCLUSION

5.0.0 Introduction

The present study entitled **"Multimodal Intervention System for Developing Sight Words among Children with Hearing Impairment"** is related to the effective use of Multimodal Intervention strategies to enhance learning of sight words. The strategies used in this study are based on 7 methods including Finger spelling, Sign language, Arm tapping, Table writing, Air writing, See and Say and Usage of words in a sentence. This study was experimental in nature where the Multimodal Intervention strategies was used to enhance their English skills through the sight words. Sight words act as the base in the overall learning enhancement. In this study, Multimodal Intervention Strategies were experimented for learning of sight words among Students with Hearing impairment from Grade 1 to 5.

5.1.0 Major Findings of the Study

10. There is significant difference in the level of acquisition of Alphabet concept among students with hearing impairment before and after introduction of Multimodal Intervention System.
11. There is significant difference in the level of acquisition of Numeral concept among students with hearing impairment before and after introduction of Multimodal Intervention System.
12. There is significant difference in the level of acquisition of Sight words among students with hearing impairment before and after introduction of Multimodal Intervention System.
13. There is no significant difference when compared the mean scores of Gender before and after introduction of Multimodal Intervention System.
14. There is no significant difference when compared the mean scores of Grade before and after introduction of Multimodal Intervention System.
15. There is no significant difference when compared the mean scores of Type of School before and after introduction of Multimodal Intervention System.
16. There is no significant influence of Gender, Grade and Type of School and their interaction on Numeral concepts before and after introduction of

Multimodal Intervention System. In the Numeral concepts the posttest scores of Male and Female were higher than pretest scores, the posttest scores of Grade 1st to 3rd and 4th to 5th were higher than pretest scores and the post test scores of Type of School is greater than pretest scores.

17. There is no significant influence of Gender, Grade and Type of School and their interaction on Alphabet concepts before and after introduction of Multimodal Intervention System. In the Alphabet concepts the posttest scores of Male and Female were higher than pretest scores, the posttest scores of Grade 1st to 3rd and 4th to 5th were higher than pretest scores and the post test scores of Type of School is greater than pretest scores.
18. There is no significant influence of Gender, Grade and Type of School and their interaction on Sight Words before and after introduction of Multimodal Intervention System. In the Sight Words the posttest scores of Male and Female were higher than pretest scores, the posttest scores of Grade 1st to 3rd and 4th to 5th were higher than pretest scores and the post test scores of Type of School is greater than pretest scores.

19. There is significant difference within performance of Students in scores of Alphabets in the Pretest, Intermediate Test and Post Test. The analysis of variance for pre, intermediate and posttest in Alphabet revealed that there is a significant improvement from pretest (Mean=18.07) to intermediate (Mean =23.13) and then posttest (Mean =23.30).
20. There is significant difference within performance of Students in scores of Numerals in the Pretest, Intermediate Test and Post Test. The analysis of variance for pre, intermediate and posttest in Numerals revealed that there is a significant improvement from pretest (Mean=9.03) to intermediate (Mean =9.40) and then posttest (Mean =9.90).
21. There is significant difference within performance of Students in scores of Sight Words in the Pretest, Intermediate Test and Post Test. The analysis of variance for pre, intermediate and post test in Sight Words revealed that there is a significant improvement from pretest (Mean=2.10) to intermediate (Mean =4.77) and then posttest (Mean =7.43).

22. There is significant influence of Gender and Types of School and their resultant interaction on performance of students in scores of Alphabets.
23. There is significant influence of Gender and Types of School and their resultant interaction on performance of students in scores of Numerals.
24. There is no significant influence of Gender and Types of School and their resultant interaction on performance of students in scores of Sight words.

5.2.0 Suggestions for Further Research

The present study suggests researchers to investigate on

1. A study on vocabulary development of Hearing impaired children before 1st Grade
2. Research may be on sight word and phonics training among hearing impaired children using oral method for communication
3. Investigator may be pursued on effect of Multimodal intervention on Reading Fluency of children with hearing impairment

5.3.0 Recommendations

1. The study recommends that the teacher training curriculum for students with hearing impairment may be designed with the instruction in the application of assistive technology, information on its availability and maintenance
2. The study recommends that any researcher developing assistive technology for educational purposes may give importance and adapt the universal design principles so that a single aid/ device can be used by the whole classroom and thus minimize discrimination of disabled and nondisabled in the inclusive school setup.
3. This study recommends the education and related stakeholders to be well oriented on the benefits of assistive technology and encourage students with disabilities to use the same which would be an equalizer in mainstream education

5.4.0 Conclusion

The investigator attempted to study the effect of Multimodal Intervention Strategies for Teaching and Learning English Sight words among Students with

Hearing impairment. The result of this experimental study showed improvement in all the Components of Sight words after Multimodal Intervention is given to the Students with Hearing impairment. Therefore, the study recommends that teachers can implement Multimodal Intervention Strategies as an effective programme to enhance teaching and learning of Sight words among the Students with Hearing impairment.

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4. https://lpvforum.com
5. https://mehranthoughts.wordpress.com
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APPENDIX - I

QUESTIONNAIRE TO ELICIT THE BACKGROUND INFORMATION OF THE SELECTED STUDENT WITH HEARING IMPAIRMENT

Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641 043

Department of Special Education

Student Profile

Basic Information:

1. Name of the student	:	
2. Age	:	
3. Date of Birth	:	
4. Gender	:	Male Female
5. Class	:	1 2 3 4 5
6. Name of the Centre/School:		
7. Type of Disability	:	Hearing Impairment Hearing Impairment with associated disability
8. Nature of Disability	:	Conductive Sensory-neural Mixed
9. Level of Disability	:	Slight 16-25dB Mild 26-40dB Moderate 41-55dB Moderately Severe 56-70db Severe 71-90dB Profound>90dB
10. Cause of Disability	:	Congenital Acquired
11. Deaf Parents	:	Yes No
12. Cochlear Implant	:	Yes No
13. Hearing aid user	:	Yes No

PRE TEST :-

To find out if the students are able to identify:

1. Alphabet
2. Numbers
3. Sight words

PRE TESTING :

1. Alphabet

S. No	Letters				Mode of Expression			
	Response (put ☑ for correct answers &put ☒ for incorrect answers				Sign language	Vocal	Oralism & Sign language	Finger spelling
1.	A		a					
2.	B		b					
3.	C		c					
4.	D		d					
5.	E		e					
6.	F		f					
7.	G		g					
8.	H		h					
9.	I		i					
10.	J		j					
11.	K		k					
12.	L		l					
13.	M		m					
14.	N		n					
15.	O		o					
16.	P		p					
17.	Q		q					
18.	R		r					
19.	S		s					
20.	T		t					
21.	U		u					
22.	V		v					
23.	W		w					
24.	X		x					
25.	Y		y					
26.	Z		z					

Total No. of letters the student can read from A to Z	_____ /26

2.Numbers

S.No	Numbers		Mode of Expression			
	Response (put ☑ for correct answers &put ☒ for incorrect answers		Sign language	Vocal	Oralism & Sign language	Finger spelling
1.	1					
2.	2					
3.	3					
4.	4					
5.	5					
6.	6					
7.	7					
8.	8					
9.	9					
10.	10					

Total No.of Numbers the student can read from 1 to 10	_____ /10

3.Sight words

S.No	Sight words		Mode of Expression			
	Response (put ☑ for correct answers &put ☒ for incorrect answers		Sign language	Vocal	Oralism & Sign language	Finger spelling
1	And					
2	They					
3	The					
4	For					
5	She					
6	By					
7	Has					
8	An					
9	Then					
10	His					
11	To					
12	Was					
13	From					
14	Are					
15	As					
16	In					
17	Once					
18	Said					
19	Had					
20	You					
21	But					
22	Them					

23	Of					
24	On					
25	Is					

Total No.of Sight words the student can read in one minute	**_____ /25**

INTERMEDIATE PROGRESS MONITORING TEST

	Day 6	**Day 12**
No. of letters that the student can read		
No. of numbers that the student can read		
No. of sight words that the student can read		

POST TEST :-

1. Alphabet

Sl.No	**Letters**				**Mode of Expression**			
	Response (put ☑ for correct answers &put ☒ for incorrect answers				**Sign language**	**Vocal**	**Oralism & Sign language**	**Finger spelling**
1.	**A**		**a**					
2.	**B**		**b**					
3.	**C**		**c**					
4.	**D**		**d**					
5.	**E**		**e**					
6.	**F**		**f**					
7.	**G**		**g**					
8.	**H**		**h**					
9.	**I**		**i**					
10.	**J**		**j**					
11.	**K**		**k**					
12.	**L**		**l**					
13.	**M**		**m**					
14.	**N**		**n**					
15.	**O**		**o**					
16.	**P**		**p**					
17.	**Q**		**q**					
18.	**R**		**r**					
19.	**S**		**s**					
20.	**T**		**t**					
21.	**U**		**u**					
22.	**V**		**v**					
23.	**W**		**w**					
24.	**X**		**x**					
25.	**Y**		**y**					
26.	**Z**		**z**					

Total No.of letters the student can read from A to Z	**_____ /26**

2.Numbers

Sl.No	**Numbers**		**Mode of Expression**			
			Sign language	**Vocal**	**Oralism & Sign language**	**Finger spelling**
	Response (put ☑ for correct answers &put ☒ for incorrect answers					
1.	**1**					
2.	**2**					
3.	**3**					
4.	**4**					
5.	**5**					
6.	**6**					
7.	**7**					
8.	**8**					
9.	**9**					
10.	**10**					

Total No.of Numbers the student can read from 1 to 10	**_____ /10**

3.Sight words

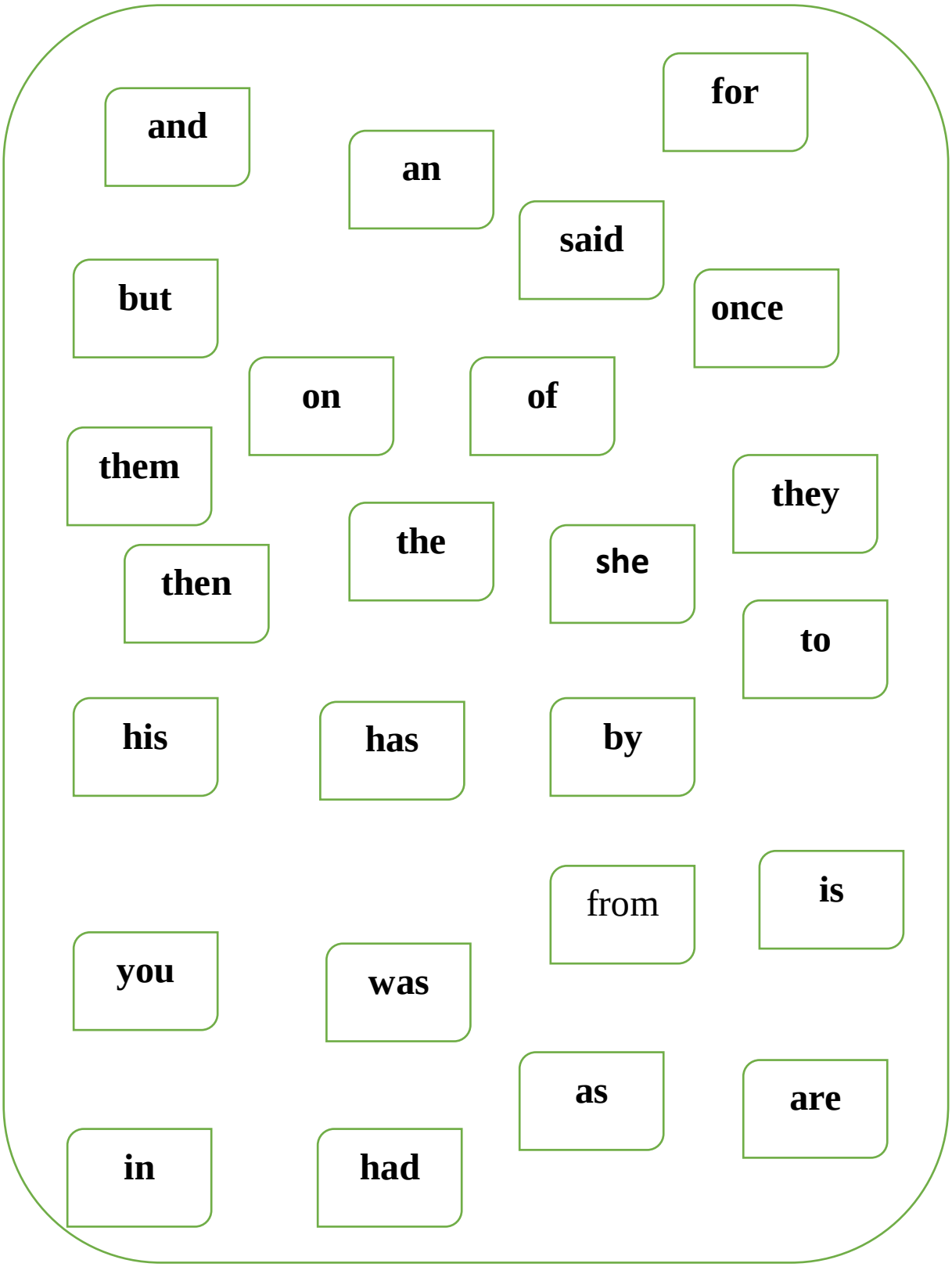
S.No	**Sight words**		**Mode of Expression**			
	Response (put ☑ for correct answers &put ☒ for incorrect answers		**Sign language**	**Vocal**	**Oralism & Sign language**	**Finger spelling**
1	And					
2	They					
3	The					
4	For					
5	She					
6	By					
7	Has					
8	An					
9	Then					
10	His					
11	To					

12	Was					
13	From					
14	Are					
15	As					
16	In					
17	Once					
18	Said					
19	Had					
20	You					
21	But					
22	Them					
23	Of					
24	On					
25	Is					

Total No.of Sight words the student can read in one minute	**_____ /25**

ALPHABET AND NUMBERS

A a	B b	C c	D d	E e	F f	G g	H h	I i	
J j	K k	L l	M m	N n	O o	P p	Q q	R r	
S s	T t	U u	V v	W w	X x	Y y	Z z		
1	2	3	4	5	6	7	8	9	10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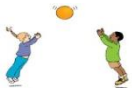
1.We are going there _____ a picnic. (for / of) 

1. A cat _____a dog. (and / the) 

2. _____ like volleyball. (but / they) 

3. _____ likes tennis. (she / his) 

4. “I am sorry,I broke it”_____Jillian. (said / you) 

5. It is _____ pencil. (his / she) 

6. A cat is _____ the bed. (on / but) 

7. A cat is _____ a hat. (but / in) 

8. I like black _____I don’t like grey. (but / for) 

9. _____ are beautiful! (you / his) 

10. _____ Sun is hot. (the / for)