PEDAGOGICAL CONSIDERATION FOR THE ENHANCEMENT OF MATHEMATICAL SKILLS AMONG THE HEARING IMPAIRED PUPILS IN SELECTED BASIC SCHOOLS IN NDOLA AND LUFWANYAMA DISTRICTS OF COPPERBELT PROVINCE, ZAMBIA

BY

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A Thesis submitted to the University of Zambia in Fulfillment of the Requirements for the Award of the Degree of Doctor of Philosophy in Special Education of the University of Zambia

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DECLARATION

I, **Christine Chishimba**, do hereby declare that this thesis represents my own work and that it has not previously been submitted for a degree at this or any other University

Date:……

Signature:……

DEDICATION

To my father, Peter Chumangulu Chishimba, who always told me that education was the key to success, had no age limit and it never ends. To my beloved husband, Maybins, who always encouraged me to do further studies and to my children, Bruno Mwamba, Jimmy Mpange, Christine Chipimpi and Faith Mushilingwa, for their understanding of my being away from home.

CERTIFICATE OF APPROVAL

This thesis by **Christine Chishimba** is approved as a fulfillment of the requirements for the award of the degree of Doctor of Philosophy of Education in Special Education of the University of Zambia.

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May God abundantly bless you all.

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ACRONYMS

AIMS	Action In teaching English, Mathematics and Science
FAMR	Finnish Association for Mental Retardation
MESVTEE	Ministry of Education, Science, Vocational Training and Early Education
NAEYC	National Association for the Education of Young Children
NCTM	National Council of Teachers of Mathematics
NORAD	Norwegian Agency for Development
PEO	Provincial Education Officer
PTA	Parents and Teachers Association
SEN	Special Educational Needs
SIDA	Swedish International Development Agency
SPSS	Statistical Package for Social Sciences
UNESCO	United Nations Education, Scientific and Cultural Organisation
USA	United States of America
ZACALD	Zambia Association for Children and Adults with Learning Disabilities
ZAMISE	Zambia Institute for Special Education

AB STRACT

The purpose of the study was to examine the factors inhibiting learning Mathematical skills among the hearing impaired pupils in selected Basic Schools in Zambia. The objectives of the study were to: investigate the factors inhibiting the learning of Mathematical skills among the hearing impaired pupils; find out the Mathematical skills taught to the hearing impaired pupils; examine the instructional strategies used in teaching Mathematical skills to the hearing impaired pupils; assess the availability of educational resources in teaching the hearing impaired pupils Mathematical skills; and ascertain the suitability of the available resources in teaching Mathematical skills to pupils with hearing impairments. An ethnographic paradigm was used in this study. This was believed to be the most appropriate approach because it provides insights and experiences of families with disabled children in real life situations better than any other approach. The sample comprised 44 teachers of mathematics and 70 pupils who were purposively selected. This method of sampling was chosen because it only targeted the teachers and pupils who were expected to have adequate information on the topic. Questionnaires and interviews were used to collect the needed data. The quantitative data from the questionnaires were analysed using the Statistical Package for Social Sciences (SPSS) while the qualitative data was analysed through emerging themes.

The findings of the study revealed that there were several factors that inhibited the hearing impaired from learning Mathematical skills. Most of the teachers (25) cited negative attitude of teachers in the delivery of the curriculum due to language barrier (teacher's lack of training or knowledge in Sign Language). Other factors according to the teachers included, inadequate textbooks and visual aids, poor methodology, and lack of clear explanation of concepts by the teachers. On the other hand, 33 pupils said that they failed to understand Mathematical concepts because teachers did not give them proper instructions in sign language while 37 of them reported that they lacked adequate textbooks to use.

In terms of the skills taught to pupils with hearing impairment, the study showed that 27 of the teachers taught pupils how to add and subtract numbers while 17 of the teachers taught the pupils how to add, subtract, multiply and divide numbers.

As regards instructional strategies used in teaching Mathematics to the hearing impaired pupils, the study revealed that 27 teachers used demonstrations and question and answer method while 7 used concrete objects and 4 used sign language in conjunction with visual aids. On the other hand, 44 pupils reported that teachers just explained concepts in sign language while 26 of them said that teachers used learning aids, books and sign language.

As regards availability of educational resources, the findings of the study showed that 27 teachers were of the view that these resources were not adequate enough. Like the teachers, 39 pupils indicated that the educational resources were not readily available while 31 were of the view that they were available. However, the study findings showed that 25 teachers used textbooks and charts while 8 used textbooks, concrete objects and charts. Further, 6 teachers used concrete objects whereas 3 used textbooks, abacus and counters.

In terms of suitability of the available educational resources, the findings of the study showed that 17 teachers were of the view that the books were not suitable for teaching the hearing impaired pupils because they were not presented in the form of concrete objects while 8 of them said that the resources available were not suitable because the materials presented in the books kept on changing now and then. Like the teachers, 43 pupils reported that the available educational resources were not suitable because the books were not in concrete form thus making it difficult for them to understand the concepts. However, 26 pupils reported that the available educational resources suitable as they could comprehend the materials.

Based on the findings of the study, the following recommendations were made: The Ministry of Education should:

- supply schools with adequate and appropriate textbooks for use by the hearing impaired pupils,
- train more teachers in Sign Language in line with the current trends in education to supplement the current number of trained teachers in schools with special units.
- conduct workshops for teachers handling pupils with hearing impairment as a way of changing their negative attitude in the delivery of Mathematical skills.
- ensure that teachers continue to teach the hearing impaired pupils Mathematical skills pertaining to addition, subtraction, multiplication, and division of numbers in line with the ever changing technology.
- continue supplying schools with appropriate instructional materials in line with the syllabi and according to grade level.
- increase the supply of relevant educational resources in schools for the teaching of Mathematical skill to pupils with hearing impairments.
- embark on producing educational materials for the hearing impaired pupils that are in the form of concrete objects so as to make pupils grasp Mathematical concepts easily.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter begins with the background of the study in which the context of the study is provided. It also gives the statement of the problem, purpose of the study together with the research objectives and research questions that guided the study. Further, it gives the significance of the study, theoretical framework, and ends with a summary of the chapter.

1.1 Background to the Study

There are many challenges and issues facing school systems in different parts of the world as they respond to all children in their communities. It is beyond doubt that across the world many children including those with disabilities do not receive adequate and relevant education. This is so despite the fact that it is now more than forty years since the nations of the world, speaking through the Universal Declaration of Human Rights, asserted that 'everyone has a right to education.'

The 1990 World Conference on Education for All, held in Thailand, highlighted the following realities: more than one hundred million children, including at least sixty million girls, have no access to primary schooling. More than one hundred million children fail to complete basic education programmes, millions satisfy the attendance requirements but do not acquire essential knowledge and skills.

The contribution of Special Education has therefore, to be considered against this background of international crisis with respect to education in general (Ainscow, 1994).

Probably the most helpful source of data with respect to special educational provision internationally arose from a survey of forty-eight countries conducted in 1986-7 (UNESCO, 1988). The information provided by this survey illustrates the discrepancies in the level of progress among the various regions and countries. It was found, for example, that thirty-four of the countries had fewer than one percent of pupils enrolled in educational programmes; ten of these countries had special education provision available for less than one-tenth of one percent of pupils. Precise figures for developing countries are particularly difficult to establish, but the studies that are available confirm the disturbing scale of the problem. For example, Ross (1988) summarized data gathered from thirteen countries in Eastern and Southern Africa indicating that virtually all these countries had special education enrolments for approximately 0.1 percent or fewer of the school population. Such data led Hegarty (1990:4) to conclude that:

> "The stark reality underlying these figures is that the great majority of children with disabilities do not receive an appropriate education, if indeed they are offered any education. In many countries, less than one child in a hundred receives the special educational provision that he/she needs".

He further states that the field of special education is of relatively recent origin. In its early stages, the emphasis was on provision for children with distinct disabilities, but with the expansion of public education in many countries, broader forms of special education have been introduced. An example of this can be seen in the United Kingdom where the first schools for the blind and hearing impaired (deaf) pupils were founded towards the end of the eighteenth century.

Many of the current practices of special education have developed since the early 1960s. This period has been marked by significant shifts in beliefs within the field and, indeed, this process of change is still apparent in many parts of the world. The people involved in special education had the tendency of isolation and this was reinforced in some countries by the fact that many of the providers of special education were Voluntary Organizations and that some special schools were located away from the community. As a result of this, significant legislation to change the basis of special education was introduced in a number of countries. Possibly, the most influential of these was Public Law 94 – 142, the '*Education for All Handicapped Children Act*' (1975), in the United States of America. This sought a legislative solution to educational inequities in that it was designed to redress the 'de facto denial of the rights to education of the handicapped' (Yanok, 1986). The key provision was the requirement that states that schools throughout the country should provide appropriate education for every school-age child, irrespective of the nature of the child's disability.

The American legislation has subsequently inspired similar developments in other Western Countries. For example, the 1981 'Education Act' in England and Wales sought to establish a new framework for children requiring special provision. Its main strategy was the introduction of the Statement of 'Special Educational Need', an extensive reporting procedure used to monitor the progress of individual pupils and, where necessary, provide them with additional resources. This legislation shares broadly similar approaches to those required by the American legislation.

Special Education started in Zambia in the 19th Century by various Missionary groups. For example, the Dutch Reformed Church, now called the African Reformed Church, started a school for the Blind at Magwero in Chipata. In 1955, the first school for the hearing impaired was established by the Dutch Reformed Church. In Luapula Province, another School for the Blind was established at Mambilima by the Christian Missions in Many Lands. This School was established in Mulundu, in Mwense District. Other Schools for persons with disabilities were developed as time went by. The growth of these schools was slow because:

(i) There was no direct involvement by the Department of African Education (the body that used to run African Education).

(ii) Parents themselves showed little or no interest in sending their children to special schools for the handicapped.

After independence in 1964, a few changes were noticed in the development of education for the handicapped in Zambia. At Primary School Level, education continued in the hands of various Mission Agencies whereas at Junior Secondary School Level, the Zambia Council for the Handicapped opened a College in Lusaka where pupils with disabilities, mostly with visual impairment, were admitted. Further, at Senior Secondary School Level, pupils with visual impairment were admitted to various Schools for the able-bodied depending on their performance in the Junior Secondary School Examinations. For the first time, pupils with disabilities were learning side by side with their counterparts without disabilities. They were being taught by teachers who had never been prepared for such a role, and examinations in some cases had to be modified to suit the requirements of the handicapped. From 1970, education for the disabled became the direct responsibility of the Ministry of Education.

The University of Zambia ran an Association Certificate in Education course which included Special Education as one of the components; the Lusaka College for Teachers of the Handicapped was opened; an Education Officer was appointed specifically for Special Education and later on Inspectors of Schools were sent by the various Donor Agencies like Norwegian Agency for Development (NORAD) and the Swedish International Development Authority (SIDA) to Zambia. During this period there has been a very great expansion in the field of Special Education. The Inspectorate is fully Zambianized and emphasis is now being placed on opening Units in Normal Stream Schools rather than separate schools for the disabled

(Katwishi, 1995). Since 2003, the Ministry of Education has been restructured and the title of Inspector of Schools has been changed to Education Standards Officer. An Education Standards Officer has been assigned to the Special Education Department for each district throughout the country.

1.2 Statement of the problem

Mathematics has been taught to hearing impaired pupils in basic and secondary schools for about 46 years and qualifications of teachers have improved but apt knowledge and mathematical skills have not improved among the hearing impaired pupils. Efforts by relevant bodies have been made and policies made for the teaching of mathematical skills to hearing impaired pupils in basic schools. However, no considerable observable changes have been exhibited by the hearing impaired pupils in basic mathematical skills.

According to Ndurum (1986), academic education is important in the education of the hearing impaired pupils. This is so because it assists in preparing these children to compete with their hearing peers.

He further argues that, special education cannot be separated from regular education and it is important in preparing children with hearing impairment for the competitive world of work and survival.

This study addresses the problem of why hearing impaired pupils fail to comprehend with mathematical skills at initial stages.

As a teacher for the Hearing Impaired pupils starting from Grade One (1) to Grade Seven (7), I discovered that there was no one route to connect with learners, especially hearing impaired pupils. Although these pupils are taught in sign language by many teachers, we may view their learning through their knowledge, understanding skills and beliefs and to translate into plans for teaching and learning is very complicated. However, Zambia's Educating Our Future (1996) emphasizes on education for all children, whether disabled or not disabled.

This really motivated the researcher in first finding out about the curriculum content, modification and translating it into sign language. The research problem was identified from the policy document, Educating Our Future (1996).

The researcher, therefore, investigated the pedagogical consideration for the enhancement of mathematical skills among the hearing impaired pupils in selected basic schools and in Units in Lufwanyama and Ndola Districts on the Copperbelt Province of Zambia.

This really motivated the researcher in first finding out about the curriculum content, modification and translating it into sign language. The research problem was identified from the policy document, Educating Our Future (1996).

1.3 Purpose of the study

The purpose of the study was to investigate pedagogical consideration for the enhancement of mathematical skills among the hearing impaired pupils in selected basic schools and units in Lufwanyama and Ndola Districts on the Copperbelt Province of Zambia.

There was need to find out the types of mathematical skills pupils learn, strategies and learning materials teachers use to make hearing impaired pupils understand mathematical skills from the initial stage.

The type of environment where teachers and pupils are found (Sydney, 2005) needs to be conducive to learning and teaching.

1.4 Objectives of the study

1. To investigate factors which inhibit the learning of mathematical skills taught to hearing impaired pupils in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia.
2. To find out the instructional strategies used by teachers to teach Mathematical skills to pupils with hearing impairment in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia.
3. To assess the availability of teaching/learning materials for teaching Mathematical skills to pupils with hearing impairments in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia.
4. To assess the suitability of the teaching/learning materials in enhancing the learning of Mathematical skills among pupils with hearing impairment in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia.

1.5 Research Questions

1. What factors inhibit the learning of Mathematical skills taught among hearing impaired pupils in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia?
2. What instructional strategies do teachers use to enhance the learning of Mathematical skills among pupils with hearing impairments in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia?
3. How available are the teaching/learning materials for teaching Mathematical skills to pupils with hearing impairments in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia?
4. How suitable are the available teaching/learning materials in enhancing the learning of Mathematical skills among pupils with hearing impairment in selected Basic Schools and Special Education Units on the Copperbelt Province of Zambia?

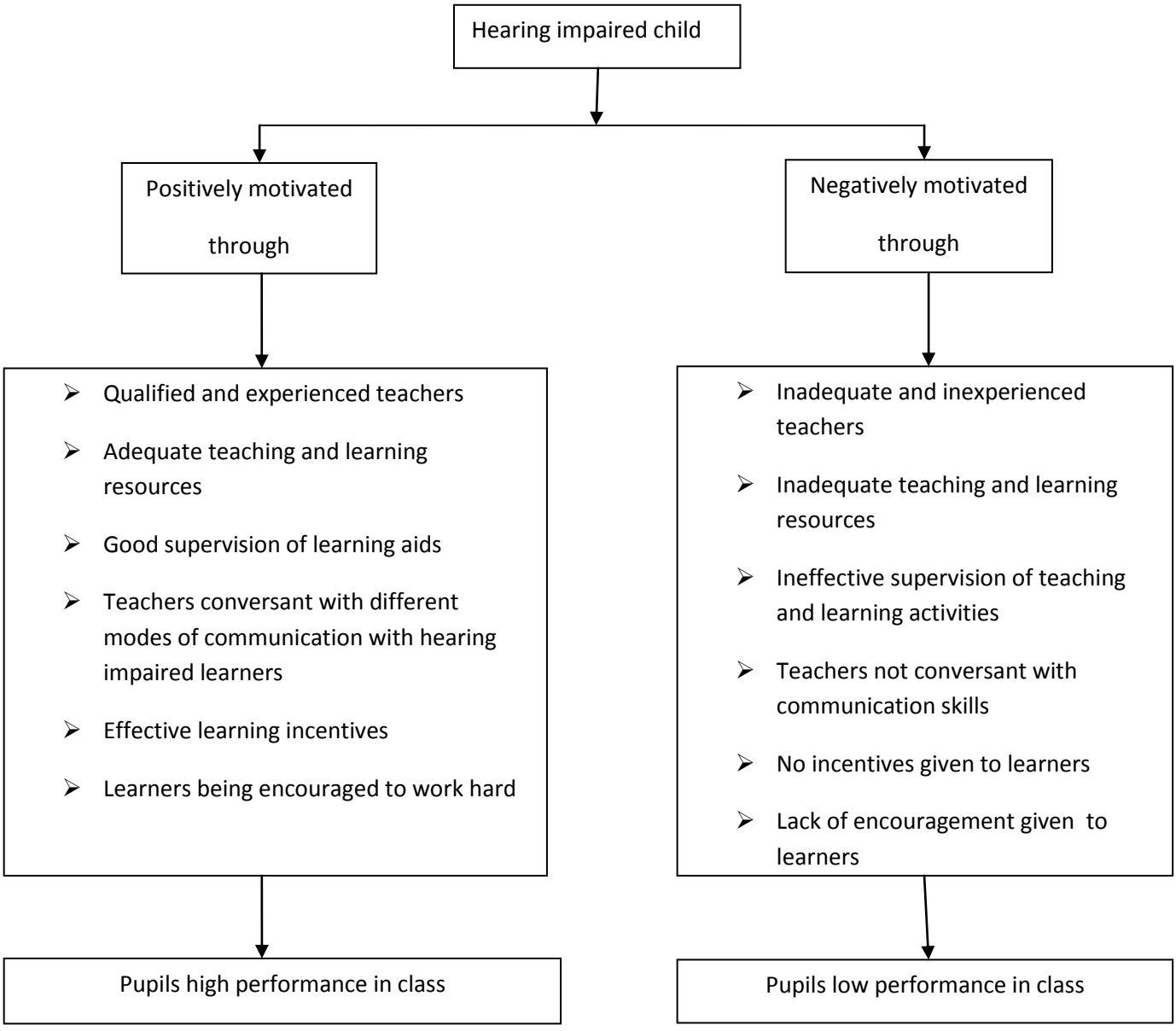
1.6 Significance of the Study

The ability to process mathematical concepts is not only important to the hearing pupils but also to the hearing impaired pupils in their day to day activities of life. Hearing impaired pupils need to learn mathematical skills in order to make correct judgements in life. It is hoped that the findings of this study may help teachers in enhancing the learning of mathematical skills among hearing impaired pupils in basic schools in Zambia.

It is further hoped that the findings would help to improve the learning and teaching of mathematical skills to the hearing impaired pupils in basic schools and units of the hearing impaired pupils in Zambia.

1.7 Theoretical Framework

EFFECTIVE LEARNING BY THE HEARING IMPAIRED



The study was based on Skinner's Theory of Motivation of Learning as cited by Orodho (2004, p.28). The theory's central argument is that students' motivation to undertake a task depends on

expected rewards. In this regard, a positively perceived reward includes positive motivation and subsequently realizes high achievement. The negatively perceived reward leads to negative attitudes and underachievement.

It is also implicit that the teaching influences the student high performance; experiences and qualifications of teachers, instructional resources and teaching strategies enhance teaching and learning (Orodho, 1996). The interaction strategies will translate into students' high performance. The children who are hearing impaired have been known to benefit in properly set up trends where services such as sign language, hearing aids and other audiological services are provided. When provided with all these facilities, the hearing impaired can benefit if the teacher is conversant with the mode of communication.

Motivation is regarded by experienced and inexperienced teachers alike as a pre-requisite for effective learning and the greatest challenge that many teachers face is to make their students want to learn. If students do not want to learn, their learning efficiency will be so low that they may learn virtually nothing. If you know how to motivate students, you can hugely increase their learning rate (Petty, 1993), as conceptualized in the framework next page.

1.8 Operational definition of terms:

- Hearing impaired – a general term to describe all levels of hearing loses ranging from mild to profound.
- Special Unit – it is a special class attached to a mainstream/regular school where the learners with hearing impairment are taught.

1.9 Summary

Zambia's special education needs provision is not fully developed. It lacks pre-school services, appropriate curriculum, poor methodologies and content resulting in poor modification. Most hearing impaired pupils are failing to acquire proper mathematical skills for lack of teaching and learning materials, poor classroom set up and poor curriculum delivery. This has posed a challenge to special needs educators in Zambia.

CHAPTER TWO

HISTORY AND EDUCATION OF THE HEARING IMPAIRED IN ZAMBIA

2.0 Overview

This chapter discusses the historical perspective and education of the hearing impaired and its systems in Zambia. The chapter ends with a summary.

2.1 Categories of disabilities

Throughout the world, there are people with different disabilities. Some disabilities are mild, some are moderate and others are severe. Though there are such disabilities, people perceive them differently. Different terms or names are given to people with disabilities by different people, such as mad, sick, fools, idiots and are a ridicule and dread or menace (Ndhlovu, 2010).

According to Mashiri (2000), people seek metaphysical explanations for that which appears extraordinary. These can be supernatural or spiritual explanations. Upon the birth of a child with disability, people ask themselves a number of questions, such as, what causes childhood disability? Why is this child different from the others? Why do things happen the way they happen? (Mashiri, 2000:171). He further states that people ask who is responsible for such a disability that violets the normal order of things.

Whereas some traditions, such as the Zambian tradition where if some questions had no ready explanations, a number of myths emerged explaining the occurrence of a disability. Such myths

are that the disability occurred because of ill luck, witchcraft, incestuous relationship or damnation by 'god' and ancestral spirits or was the result of the mother's wrong doings.

The Zambian tradition had a negative view of disability, such that when a baby was born with a disability, the baby was killed to remove the curse from the family. Fraser (1990) also held the same negative view and said that associating with a person with a disability would bring contamination to the family. Other scholars like Manion and Bersani (1987) stated that, in ancient Rome, parents of children with disabilities drowned them in the Tiger River to relieve themselves of the responsibility of taking care of their disabled children.

However, not all people held the same negative view. For example, Gates (2000) found out that in Judaeo – Hellenistic world, people with disabilities were often perceived as God's gifts and were treated with kindness. This positive perception continued with the advent of independence in Zambia in 1964 and also the coming of Christianity in the Africa. In Zambia, initially, early Missionaries were in-charge of the provision of education and opened schools for children with disabilities. These schools included Magwero in Eastern Province and Mambilima in Luapula Province as table 2.1 below illustrates. Missionaries brought in Religious Education and Training in Practical life skills such as basketry, sewing and weaving. One school was built in Ndola, known as Rehabilitation Centre where skills mentioned were taught.

Table 2.1: Disability Categories

Province	School	Year opened	Type of disability	Missionaries
Eastern	Magwero	1935	Blind	Dutch Reformed
Eastern	Magwero	1955	Hearing Impaired	Dutch Reformed
Luapula	Mambilima	1955	Blind	Christian Mission in Many Lands (CMML)

Source: Central Statistical Office (1969, 1980, 1990 and 2000). Censuses of Population and Housing.

Since the education of people with special educational needs was basically viewed as 'a moral and religious obligation', at the time of attainment of independence by Zambia, there were only 28 schools providing education at Basic level and there were 51 at Primary (Educating Our Future, 1996).

Ndhlovu (2010), in Potts and Fido (1991) argued that until recent years, education services for people with disabilities have been dominated by the belief that disability is a social evil requiring control and confinement. In addition, in developing countries like Zambia, families of disabled children suffer enormous problems which according to Holborrow and McPherson (1985), are difficult to perceive by people in the West such as problems due to poverty, ignorance and disease, coupled with lack of information and professional help (Katwishi, 1995). Society needed to assist persons with disabilities to keep them out of social vices.

The next section relates how the society perceived persons with disabilities in general, and the hearing impaired in particular, in Zambia.

2.2 Societal attitude towards children with hearing impairment

Before 1800, disabled people were abandoned and left to die, thrown over a cliff or left in the wilderness to die because they were considered to be fools or witches believed to possess demons or evil spirits. The move to abandon or murder the disabled was supported that the action was directed against the devil and not the infant (Mashiri, 2000:182). Similar views were made by Gartner et al, 1991 who pointed out that culture affects how people view impairment, treat persons with it and how it affects persons with it. The implication of such negative beliefs and attitudes towards children with hearing impairment was that such children were perceived as cursed people and were not expected to contribute to the development of society. If anything, they were expected to be isolated and lead a miserable life. The focus of this study was on classroom factors inhibiting the learning of mathematical skills among children with hearing impairment.

Special education has been neglected in Zambia for quite some time. In 1905, a missionary by the name of Issie Hofmeyer of the Dutch Reformed Church made the first attempt in Eastern Province of Zambia when he started to teach the blind to read and write. In 1914, Ella Bates taught a class of blind boys at Nyanje before the school was moved to Madzi Moyo. Fifteen years later, she started another school at Magwero that attracted people from neighbouring countries like Zaire, Congo, then Malawi and Mozambique. The main reason was to teach children with visual and others with hearing impairment practical skills such as basketry and

pottery. Though these schools were opened not all children with disabilities were in school, because challenges to access education for most hearing impaired pupils start right at the family level. These pupils are faced with negative attitudes from family members. These attitudes are mainly reflected in the view that sending children with disabilities to school was a waste of time (Abosi, 1996). He further states that people believed that children with disabilities are not able to learn. Parents and families have a tendency of prioritizing household chores instead of education, in some cases, related to all children, but in many cases when it comes to people with disabilities, hearing impairment in particular. There is also a tendency to keep girls with hearing impairment at home, thinking that they are even less able to learn than boys.

In Zambia, most children with hearing impairment/disabilities come from poverty-stricken backgrounds and this hinders families from investing in their children's education. When there are not enough resources in a family, often the non-disabled children have the priority. This kind of attitude towards girls has significant implications in relation to the attitudes of parents towards their hearing impaired children. For example, parents of the hearing impaired children would not find time to take their children to school because of their perception that these children would not be able to contribute effectively with their hearing impairments.

2.3 Legislation and policies

The Ministry of Education, Science, Vocational Training and Early Education upholds the principle that every individual has an equal right to educational opportunity. This means that every individual, regardless of personal circumstances or capacity, has a right to access to and participation in education system. Ensuring full equality of access, participation and benefit for

all pupils necessitates interventions at all levels to support children at risk (Educating Our Future, 1996:66).

While educational policies in Zambia do not openly discriminate against people with disabilities, there is a general feeling that school authorities do not understand disability issues and are perceived as unwilling to make any efforts to ensure that these issues are effectively addressed. Most school Head teachers are reluctant to enroll children with hearing impairment to a point where families of people with such disabilities have to negotiate with school authorities to have their children enrolled in school. Teachers have difficulty in paying attention to pupils with hearing impairment due to lack of communication skills, while there are inadequate facilities for special classes within regular schools. Generally, schools do not have enough qualified staff to meet the special educational needs of pupils with hearing impairment.

Teachers' Training Colleges like ZAMISE and the University of Zambia produce teachers in special education but these teachers are not able to sign or read Braille. Existing special needs education staff have low levels of professional knowledge and skills and there are no additional capacity – building courses to top up the basic skills that they have. There is also general problem in the education system of inadequate financial resources, resulting in the lack of equipment and materials for special needs for hearing impaired pupils and lack of funds for maintenance of existing equipment and purchase of material supplies. Pupils with hearing impairments in rural areas have to travel long distances to schools and without the means of transport, it is impossible to attend school. Most disturbing though, is the situation for pupils with hearing impairments. They are unable to receive education beyond Basic School.

Most teachers that are available to teach the hearing impaired are Primary School teachers with very few at Basic level. Hearing impaired pupils fail to learn mathematical skills due to the curriculum which is also not sensitive to their needs and the approach is not holistic (Abosi, 1996). The lack of proper training in special education coupled with lack of educational resources inhibit the learning of mathematical skills by the hearing impaired pupils.

2.4 Education in Zambia and its implications on pupils with hearing impairment

In order to effectively discuss the classroom factors inhibiting the learning of mathematical skills among hearing impaired pupils, it is important to understand the education system that the hearing impaired pupils pass through. The system and its implications on the learning of the hearing impaired pupils are discussed below. It covers the educational management in Zambia and the Ministry of Education, Science, Vocational Training and Early Education.

2.4.1 Education management

The education sector is managed by the Ministry of Education, Science and Technology and Early Childhood. This Ministry is responsible for providing and managing Early, Primary, Secondary and Tertiary education. Both the able-bodied and those with disabilities have opportunity to access quality education and that they are provided with appropriate learning opportunities to achieve their full potential. There are also other ministries that are involved in the provision of education.

Ministry of Education was decentralized in early 2000 and this was a major priority of education sector in Zambia. This did not only involve decentralization of specified powers and programs to

Boards of education, but also restructuring of the Ministry of Education, Science, Vocational Training and Early Education to ensure greater efficiency, effectiveness and accountability. Under the newly restructured Ministry of Education, there are five Directorates that is; Planning and Information, Standards and Curriculum Development, Distance Education, Teacher Education and Specialized Services and Human Resource and Administration. Within the decentralized system, the MESVTEE Headquarters retained the responsibility for key national functions of drafting legislation, formulation of policies, planning at national level, mobilization and allocation of resources, development of national curriculum, setting of educational standards, supervision, monitoring and evaluation. All the five directorates coordinate the provision of education but the Directorate of Teacher Education and Specialized Services is directly responsible for the management of Special Education in the MESVTEE.

For the purpose of efficiency and effective management of education, each of the ten (10) Provinces of Zambia is headed by the Provincial Education Officer (PEO). The Provincial Education Officers implement MESVTEE policies, monitor educational activities in their provinces as well as supervising the District Education Board Secretaries. The District Education Board Secretaries manage educational activities in the Districts. The District Education Secretaries are assisted by the District Education Standards Officers who ensure that schools adhere to set standards by the MESVTEE. At school level, the Head teacher is in charge of managing the school and serves as a link between the school and the Ministry of Education through the District Education Board Secretary. The Head teacher is also a link between the school and the community through Parents and Teachers Association (PTA).

In relation to this study, a discussion of the structure for the Ministry of Education provides insights in what should happen in the classroom to prepare hearing impaired pupils. For instance, if the hearing impaired pupils have no teachers to teach them communication skills, that is, sign language, the standards should come in to help the situation. The teacher for sign language should be brought in. in the case of hearing impaired pupils not learning mathematical skills, standards department should find someone to learn sign language and mathematical skills using a lot of learning materials because the ears are in their eyes so, when they see and manipulate objects they remember. If the problem of understanding the concepts is attributed to the type of curriculum, this may mean modification of the curriculum to suit their levels and abilities. If the problem is inadequate preparation, the standards department will send their staff to monitor the teachers and to see to it that they adhere to the set standards and lessen problems in class.

2.4.2 Special education in Zambia

Education for children with special needs has been in existence close to one hundred years in Zambia. The first attempts were made at Magwero in Eastern Province, in 1905. Following the success of this experiment, Europeans came and established schools and centres for children with special needs. Sixty years later, the Zambian Government realized that it was its responsibility to establish special education institutions for the disabled. In its quest to establish special education institutions, the Ministry of Education, Science, Vocational Training and Early Education was in 1971 mandated to take up the portfolio of educating children with special educational needs. Though there was this takeover, the Government of the Republic of Zambia had not yet constructed any school for pupils with disabilities. The existing schools were those built by the Missionaries. However, in 2003 a School for Visually Impaired called Lions Basic School for the

Blind was built in Ndola by the Lions Club International. On the other hand, apart from schools, some children with special educational needs are being catered for in Hospitals (Ministry of Education, 1996).

In terms of administration, the MESVTEE administers special education. Currently, the educational needs of children with special needs are catered for through special education schools and units attached to regular schools. Hence, special education is not an educational programme entirely different from that normally provided to pupils in regular schools of the same age, but refers to those aspects which are unique or are additional to the regular educational programme. Different arrangements exist depending on the extent of the child's level of disability. Where the difference is profound, the child might spend most of the time in a special class with the specialist teacher. Nonetheless, for the hearing impaired pupils to learn effectively, the curriculum should be concerned with the pupils' complete needs; those of the body, mind, social, moral as well as spiritual needs.

Although the curriculum must deal with wide areas of human experience, knowledge and abilities, it should not be fragmented into rigid subject – defined compartments, especially at primary school level. The child at this stage has not acquired the analytical capability of separating the world of experience, which is unified and integrated into clearly defined categories. The curriculum, therefore, should respond to the child's unified outlook on life by itself being unified and integrated.

A further general requirement of the curriculum at this stage is that it should take account of the fact that the child's dominant way of experiencing and learning is through exploration and activity. Hence, the curriculum as taught should stimulate learning through inquiry, guided discovery, problem- solving, application and similar activity – based teaching and learning methods. This should be the concern to teachers as they prepare their lessons. The curriculum should always be flexible and modified to meet the learning needs of hearing impaired pupils (Human Rights Watch, USA, 2011). The paper further indicates that for effective teaching, teachers should use appropriate teaching and learning materials to facilitate education for hearing impaired pupils. In order to meet the demands of modern society, there is need to reform the curriculum at all levels and improve on methodologies.

As earlier alluded, education in Zambia is characterized by reforms on special education which include; the 1977 Education Reform Policy on Special Education, the 1992 Focus on Learning Policy document and the 1996 Educating Our Future Policy document.

2.4.2.1 The 1977 Education Reform Policy on Special Education

The first policy pertaining to special education came into being in 1977. The Government has repeatedly stressed the need to create a system of education which is properly attuned to, and more fully meets the needs and aspirations of Zambians and moves in the direction we have chosen as a country. In relation to special education, the policy document states that:

> All handicapped children, like any other children, are entitled to education. They should receive Basic and Further education full-time or part-time study as any other children. Further, since the handicapped children are a special case, there should even be 'positive discrimination' in their favour in the provision of facilities and amenities for educational purposes" (Educational Reforms, 1977).

Education Reform, 1977 policy had good intentions in favour of pupils with special needs including the hearing impaired. The policy has not mentioned how the children were going to be catered for in case they were mainstreamed in regular schools. The policy only mentioned that since handicapped children are a special case, there should even be a positive discrimination. This means that children with disabilities should be isolated. Children with disabilities should learn with other children in order to promote integration.

2.4.2.2 The 1992 Policy Document

This focuses on learning. The policy document focus on learning was the second educational policy. In 1990, there was a World Conference on Education for All which took place in Thailand at Jomotein. The Conference stressed the importance of access to educational opportunities by stating that every person, child, youth and adult, shall be able to benefit from educational opportunities designed to meet their basic learning needs (Ministry of Education, 1992). The 1992 Educational Policy therefore, stressed the mobilization of resources for the development of school education for all, including pupils with hearing impairments. In relation to this study, this policy implied that if schools had adequate resources, the products of school education could be adequately prepared for challenges after school, thereby, living good quality of life with social, material and physical well-being.

2.4.2.3 The 1996 Policy Document – Educating Our Future

The third major educational policy document was Educating Our Future. This document is the fruit of broad – based consultation process, in which most people participated. The people involved were from other Government Ministries, as well as the teaching profession and the

Universities, communities and the private sector, the Churches and other non-governmental agencies, and international aid donors – all collaborating generously with the Ministry's own personnel, has ensured that the National Policy is widely representative. The policy document addresses the entire field of formal institutional education, paying particular attention to democratization, decentralization and productivity on the one hand. It also addresses curriculum relevance and diversification, efficient and cost-effective management, capacity building, cost sharing, and revitalized partnerships on education. The policy recognizes the basic right of every Zambian to educational provision as access, equity and quality maintenance at all delivery points of education.

The government is fully committed to the successful implementation of these policies set out in the three documents. This can also be seen in the government mission statement which states that:

> The mission of the Ministry of Education, Science, Vocational Training and Early Educationists to guide the provision of education for all Zambians so that they are able to pursue knowledge and skills, manifest excellence in performance and moral uprightness, defend democratic ideals, and accept and value other persons on the basis of their personal worth and dignity, irrespective of gender, religious, ethnic or any other discriminatory characteristics.

This policy document has positive intentions in favour of children with disabilities and able-bodied. It also emphasizes on the provision of education concerning pupils with different disabilities including pupils with hearing impairments. To support the above statement, the government has come up with a policy which states that:

i) The MESVTEE will ensure equality of educational opportunity for children with special educational needs.

ii) The MESVTEE is committed to providing education of particularly good quality to pupils with special educational needs.

iii) The MESVTEE will improve and strengthen the supervision and management of special education across the country ((MoE, 1996).

In order to achieve the above policy statements, the government came up with the following strategies:

1) Working closely with the Ministry of Health. The MESVTEE will decentralize services for the identification, assessment and placement of children with special educational needs.

2) To a greatest extent possible, the MESVTEE will integrate pupils with special educational needs into mainstream institutions and will provide them with necessary facilities. However, where need is established, the Ministry will participate in the provision of new special schools for the severely impaired.

3) The MESVTEE will cooperate with private, religious, community and philanthropic organizations

   i) Meeting the special educational needs of exceptional children, and

   ii) Providing outreach services for children whose impairments prevent normal attendance in schools

4) Education Boards will have responsibility for ensuring that the special education needs of children within their jurisdiction are met and will be evaluated on their discharge of this responsibility

5) The MESVTEE will dispense with all direct educational costs for children with special educational needs and will provide bursaries for such individuals.

6) The MESVTEE will give attention to the educational needs of exceptional children by

i) Training and adequate number of teachers in special education

ii) Designing appropriate curricula and teaching materials.

iii) Prescribing specifications for special furniture, equipment, and aids and infrastructure provision

iv) Developing appropriate support, technology systems and

v) Providing adequate supervision of special education programs

7) The MESVTEE will enlarge and decentralize the special education inspectorate

8) Planning for special education provision will be built into the Ministry's mainstream strategic planning and in support of this, the information system on special education and national needs in this area will be improved (Mo E, 1996).

2.5 Development of Special Education on the Copperbelt – Ndola and Lufwanyama Districts

Education for children with special needs has been in existence on the Copperbelt since 1971. For instance, a school for the visually impaired pupils called Lions School for the visually impaired was built by the International Lions Club in Ndola, Lufwanyama district Lions school for visually impaired is a Residential school in Ndola. Education of pupils with hearing impairment was made possible through the joint intervention of the Finish Association for Mental Retardation (FAMR) and Zambia Association for Children and Adults with Learning Disabilities (ZACALD). FAMR and ZACALD are Non-Governmental Organizations based in

Zambia and managed by Zambians. This joint effort saw the introduction of special education units. These units were established at Primary School level. In Ndola, there are three (3) Units in regular schools. The Units are at Kamba Basic School, Kansenshi Basic School and Chilengwa Basic School. Apart from the listed Units some children with education needs are catered for in Hospitals. There is also one residential school in Lufwanyama district which caters for pupils with hearing impairments. The school is called St. Joseph School for the Deaf. The district acted as a pilot project for inclusive education, this was moving from a situation where a large number of children with special needs were educated in special schools or special classes to a situation where large numbers of pupils with special needs were integrated into mainstream education (Kalaluka, et al. 2003).

In 2009, enrolment figures for pupils with disabilities on the Copperbelt of pupils were higher for males as compared to their female counterparts. Table 2.2 below shows the enrolments by gender for the years 2009 to 2011.

Table 2.2: Pupils with hearing impairments on the Copperbelt Province by gender (2009 – 2011)

Year	Grade	Male	Female	Total
2009	1	152	121	273
	2	145	142	287
	3	156	158	314
	4	176	194	370
	5	204	171	375
	6	189	172	361
	7	148	161	309
	8	89	72	161
	9	67	91	158
Total (All Grades)	1 – 9	1326	1282	2608
2010	1	150	120	270
	2	143	140	283
	3	154	156	310
	4	173	190	363
	5	200	168	368
	6	185	169	354
	7	146	159	305
	8	89	73	162
	9	68	91	159
Total	1 – 9	1308	1266	2574
2011	1	142	139	281
	2	156	158	314
	3	175	192	367
	4	180	151	331
	5	204	186	390
	6	89	72	161
	7	90	74	164
	8	18	12	30
	9	08	13	21
Total	1 – 9	1062	997	2059

Source: MESVTEE (2011) – Planning Department: Copperbelt Province

According to the Ministry of Education, Science, Vocational Training and Early Education, the enrolment age for children in Zambia is Seven (7) years. By this age, every child should be in school, whether disabled or able-bodied. The main aim of the school system is to provide quality

education to all pupils. Children need to learn as opportunities are provided for them. The education system should allow hearing impaired pupils to be able to learn and acquire useful knowledge, reasoning ability, skills and values. The Ministry of Education believes that it is of the highest importance that upper basic education provides pupils with an opportunity to take at least one practical or technical subject that is taught by a qualified teacher in an adequately resourced learning environment (Educating Our Future, 1996). The implication of providing such basic education is to prepare hearing impaired pupils for life after school. The provision of education is guided by several policies and among them is "Education for All" which states that:

> To ensure quality education for all pupils, attention must be paid to the relevance of the curriculum, the role of teachers and the nature and ethos of the learning environment. This will contribute to increased retention rates and also makes the process of education empowering, participatory, transparent and accountable (UNESCO, 2007).

However, UNESCO (2007), argues that in order for "Education for All" to effectively work out, the following elements should be addressed:

- ***The provision of education throughout all stages of childhood and beyond***

  "Learning is a lifelong process. A right-based approach to education seeks to build opportunities for children to achieve their optimum capacities throughout their childhood and beyond. It requires a life – cycle approach, investing in learning and ensuring effective transition at each stage of a child's life."

Although hearing impaired children are not exposed to early childhood education, they have the right to education as early as pre-school education, with systematic and quality family involvement.

- ***Quality education during early years***

  This plays a vital part in promoting readiness for school and is also the best guarantee for attaining the Millennium Development Goals and Education for All. While human rights law affirms that every child is entitled to free, compulsory primary education obligation in respect of Basic education are less emphatic. The duty is to encourage its development and make it available and accessible to every child including hearing impaired pupils, and free where possible. Moreover, learning needs for all the hearing impaired pupils should be met through access to learning and life skills programs. Government should support the achievement of a strong base for life - long learning, through education directed towards self-directed learning and preparation for adult life.

- ***Availability and accessibility of education***

  The Government should provide sufficient resources, to fulfill the right to education for every child. Hearing impaired children should also be provided with available school places or learning opportunities, together with appropriately qualified teachers and adequate resources. The level of provision of primary and basic education must be consistent with the numbers of pupils entitled to receive it. In addition, the paper indicates that every child has an equal right to attend school. Making schools accessible and available is an important step. Equality of opportunities can only be achieved by only removing factors that inhibit hearing impaired pupils access to school.

In order for teachers to give quality education to hearing impaired pupils they must know that hearing impaired pupils are individuals with different needs. Hence, they need education to develop their individual skills.

This perspective has been supported by UNESCO (2007) in the Convention on the Rights of the child, which formulates a philosophy of respect for the children as individuals, recognizing each child as "unique in characteristics, interests, abilities and needs." Article 29 implies "the need for education to be child-centred, child-friendly and empowering, and it highlights the need for educational processes to be based on the very principle it enunciates." Every child has a right to an education that empowers him or her by developing life skills, learning and other capacities, self-esteem and self-confidence. The provision of quality education demands attention to the content of the curriculum, the nature of the teaching and the learning environment. It implies a need for the creation of flexible, effective and respectful learning environments that are responsive to the needs of all the children.

2.6 Summary

Throughout the history, pupils with hearing impairments have been perceived as mad, sick, fools and idiots. Many people have asked a lot of questions as to why things have happened the way they have happened.

It can be noted that education for children with disabilities were fully adopted by Government in 1971 while education for pupils with hearing impairment was introduced in Zambia before independence.

Hearing impaired pupils can learn like any other child, all they need is modification of curriculum content. It is the mandate of the Ministry of Education to equip every learner with quality education and attention should be paid to the relevance of the curriculum, the role of

teachers, sufficient resources, schools should be accessible and available for every child. In addition, teachers should take pupils with hearing impairment as individuals with different needs like everybody else and they need quality education to develop their skills.

CHAPTER THREE

LITERATURE REVIEW

3.0 Overview

This chapter reviews literature on pedagogical consideration for the enhancement of mathematical skills among the hearing impaired pupils in selected basic schools on the Copperbelt Province of Zambia. The chapter identifies mathematical skills taught to pupils with hearing impairment, mode of communication used in teaching mathematical skills, instructional strategies used and their impact on learning mathematical skills and assessing the availability of educational resources and their suitability in learning of hearing impaired pupils.

3.1 The importance of learning mathematical skills among the hearing impaired pupils in Basic Schools

Gearheart (1986) has observed that pupils with hearing impairment have problems in learning mathematical skills. He further observes that although mathematics has a prime importance in our daily life, the aspect of normal and abnormal development of mathematical skills has received very little attention compared to reading and writing skills. While it is true that mathematics has not received much attention, studies that have been conducted have yielded a wealth of insights into the nature and prevalence of mathematical difficulties (Burton, 1994).

Available literature reveals that the teaching of mathematics to pupils with hearing impairment is important. Mathematical skills should be taught so that pupils with hearing impairment can gain

the ability to solve real life problems. So, hearing impaired pupils like any other pupils should learn mathematical skills.

Spens (1938) also states that, without acquaintance with mathematics taught, much that is fundamental in modern life is unintelligible. Today's society is technologically oriented and information-rich and children need to develop mathematical skills in order to have the confidence and competence to be effective participants in our technological society. To deny pupils with hearing impairment access to mathematical skills is a severe handicap in their dealing with social issues that are based on mathematical operations. Ahmed (1987) indicates that most school going children face problems in learning mathematical skills. While Mannigel (1992) argues that mathematical problems emerge early in life and require early intervention if children are to overcome their mathematical handicaps later in life.

Ahmed (1987) states that if improvement in the learning of mathematical skills are to be widespread, it is inevitable that sustained change must begin with teachers themselves. Ahmed (1987) further argues that teachers' beliefs about the nature of mathematics, how children learn about their own roles, are critical factors in determining what actually happens in the classroom and therefore, determining the quality of pupils' mathematical skills acquisition and development. This can be supported through children's interests, and how they build experiences with mathematical content on what they already know. Schwartz (2005) states that focusing on tuning in to children as active learners also embraces special needs of children for whom there is greater distance between the mainstream group and their life's experiences. He further argues that children with physical and social handicaps need information and instructional skills to meet

the additional challenges presented by these groups. Developmental sequences and instrumental design ideas are integral to teaching mathematics to all children.

The challenges to link mathematical learning to hearing impaired pupils' interests defines the challenge of early childhood mathematics learning.

The understanding of how hearing impaired pupils learn mathematical skills and what they know at various stages of their development has been a driving force behind the lifelong work of many educational researchers and practitioners. Teachers should be encouraged to develop the understanding and knowledge by reflecting on hearing impaired pupils learning and their own teaching of mathematical skills (Mannigel, 1982). Mannigel (1982) further indicates that to become better teachers of mathematics, it is crucial that teachers continue to broaden their knowledge of how pupils with hearing impairment come to understand mathematical concepts. How hearing impaired pupils learn mathematical skills, however, depends on what happens in the classroom, as well as in the mind. Solving that piece of the puzzle would require the perspective and insights of a teacher both well versed in mathematics and mathematical pedagogy and experienced in teaching pupils with hearing impaired pupils or pupils with learning disabilities.

Cornelius (1982:132) in a supportive view states that 'inevitably, the key to good, successful learning of mathematics, is the teacher.' The teacher is the key contributor to pupils' learning of mathematical skills, and as such, it is taken as centre stage in pupils' failure or success in acquiring and developing mathematical skills. There are a number of factors influencing the learning of mathematical skills among pupils with hearing impairments. These include

mathematical skills, inadequate teachers, instructional skills, educational resources, mode of communication, inadequate skills in sign language and relationships between teacher and pupils.

3.2 Mathematical skills taught to pupils with hearing impairments in Basic Schools

Mathematics is a complex subject which involves among other things, evaluating pupils' weak and strong learning points so that remedial work is immediately provided. For pupils, what they already know has some influence on their learning as some new material may not make sense without previous knowledge.

Learning mathematical skills involves reasoning, developing problem solving skills and remembering facts about different concepts and theories (Davis, 1996). Unless pupils with hearing impairment are able to use these skills together independently, it may be difficult to find solutions to problems.

Children's initial understanding of mathematical sets grows out of their early experiences as they make collections of concrete materials to serve their own purposes. A number of large international research studies (Tiss, 1995, 1999, 2003; PISA, 2003) have helped the mathematics education community address the task of improving mathematical skills learning and achievement for all students through teaching better mathematics and learning mathematics better. PISA (2003) further indicates that if we are to realize the goal of empowering the learner in mathematical skills, we are challenged to systematically explore teacher talk. One critical goal at the heart of quality interaction is fostering intellectual autonomy in the learner. This requires that the adult distinguishes between those comments and questions that unwittingly encourage

dependency upon the authority figure and those that support the growth of academic autonomy. The former transfers the basis of evaluation of a child's thinking or action from the child to the adult, the latter, those that empower the child to pursue inquiry, skill development and problem solving, help the child revisit and extend a learning experience. Authentic discussions serve the long term goal of empowering children as thinkers.

Baroody (1987) notes that pupils with hearing impairment need to acquire skills in reading and writing, numbers, counting objects, use of the four basic mathematical operational skills, i.e. addition, subtraction, multiplication and division and apply these skills in counting. Bobis (2004) indicates that the number concept focuses on early number learning that is counting, patterning, matching number with objects and counting tables are presented through examples of assessment tasks, children's responses and learning frameworks in number. The learning of number facts is presented through mathematical strategies of addition. This may mean that children in their first year of school are already working with abstract counting skills and knowledge of number facts which will promote basic counting strategies. Bobis (2004) further states that recognizing and creating patterns are fundamental to developing number concepts and relationships. This will help hearing impaired pupils immediately recognize how many items are in a small group. Identifying the quantities on dot cards can be extended to include many aspects of learning by requiring children to match patterns with objects.

Ginsburg (1977) has identified the initial intuitive stages of mathematics learning as the 'informal stage.' A young child learns the language of magnitude (more, less, bigger, smaller) and equivalence (same) at home long before schooling begins. In much the same way, a child

learns to chant the alphabet before knowing how to use it. Children also learn sequence at home. This sequence is a kind of song they discover and it must go in a particular order. This does not happen to hearing impaired pupils, they normally move from basic skills of counting to more complex counting. For example, when the hearing impaired pupils sees the problem 4 + _____ = 6, they often respond with an answer 10. In this problem, the hearing impaired pupils first count four objects then six objects and adds the two together. The teacher should help the hearing impaired pupils by teaching them '4 + what number equals 6?' The explanation will help the pupils to explore different approaches to solving a problem and become independent thinkers (Baroody, 1987). Orton (1993) states that mathematics is all about problem solving. One of the best ways to help pupils learn mathematical skills is to present them with a problem in which they have to devise their own strategies to find the solution. He further states that for hearing impaired pupils to understand basic operation skills, they need to start with simple counting strategies and develop mastery at the basic factors and eventually become competent users of mathematical skills. Failure to develop mastery is likely to impede learning of higher order mathematical skills.

It is also helpful to know that one of the core influences on learning is the rate at which one acquires knowledge. According to Karen (2006), students are expected to enter their mathematics class with basic conceptual knowledge of numbers and to have the declarative and procedural knowledge required for higher level learning. He further indicates that they are also expected to be self-directed, independent learners who are able to comprehend what they are learning and connect that learning to what they have previously learned. Given the teacher, classroom, and curricular expectations in a hearing impaired mathematics class, hearing impaired

pupils are clearly at a disadvantage because they often do not have the necessary background knowledge or pupil behavior required for success. These pupils with hearing impairment need adaptations and accommodations in mathematics classes if they are going to succeed in a typical mathematics classroom.

Hearing impaired pupils' poor performance in mathematics is of paramount concern at both national and local levels. However, basic mathematics represents a special challenge for educators because teachers assume that hearing impaired pupils will have acquired the foundation for higher level mathematics skills. This foundation includes understanding of mathematical concepts, mastery of basic skills, and problem – solving strategies. Unfortunately, many students enter lower basic without this foundation.

Karen et al. (2006) states that results of the Third International Mathematics and Science Study confirms the importance of conceptually guided instruction in helping hearing impaired pupils grasp mathematical skills. Unfortunately, hearing impaired pupils are particularly weak in mathematics instruction and as a result, there has been a primary emphasis on the acquisition of mathematical basic skills. Karen et al. (2006) indicates that students with mathematical problems are at risk of failure at upper basic school because they generally are unprepared for rigor of the lower school in terms of learning mathematical skills. Teachers at Primary school usually have a higher level of content knowledge and have different expectations for children with hearing impairment. They expect these pupils to have mastered the basic mathematical skills required for higher level learning in mathematics.

3.3 Qualifications of teachers teaching pupils with hearing impairments

It is worth acknowledging from the start that teachers play a major part in creating the right environment in which pupils can best learn mathematical skills. The significance of their beliefs about mathematics, mathematics teaching and how pupils learn mathematics, have great influence on their classroom behavior and significantly contribute to pupils' improvement.

Siwale (1995), carried out a survey on the learning of mathematics on the Copperbelt of Zambia. His findings revealed that most of the teachers who teach mathematics at Upper Primary Schools are seconded teachers who have not gone through secondary school teacher training in mathematics. He further states that unqualified teachers impede proper pupil mathematics development and this leads to inappropriate teaching such as lack of continuity in topics. Teaching where meaning and purpose of teaching mathematical skills are not made clear to hearing impaired pupils contributes to lack of enjoyment and pleasure that there is in mathematical skills.

Other researchers such as Burnett and Irons (1998) felt that pupils with hearing impairment need to appreciate and to know that mathematical skills are useful in other subjects, in games and in their daily lives. They further indicate that lower basic classes should have qualified and competent teachers who can fulfill hearing impaired pupils' needs in mathematical skills.

Mcleskey et al. (1996) state that changes are necessary for a teacher to prepare for the challenges of teaching in the current environment where qualified teachers adapt to new teaching arrangements and standards. Austin (2001) revealed that hearing impaired pupils will only learn mathematical skills when the teacher is qualified and competent enough to typically make

modifications when content is taught. Mcleskey et al. (1996) further indicated that when qualified teachers handle children with hearing impairment, it is more likely that strategies can be developed to address areas of need. They can also decide on modifications that could benefit hearing impaired pupils. In the absence of qualified teachers, hearing impaired pupils may not be motivated and the development of mathematical skills would not be there.

Rueda and Monzo (2002) suggested that when hearing impaired pupils are taught by qualified teachers they would be able to learn the content and understand the concepts and the instructional process that is being used. It would also help teachers think of ways in which they can most effectively meet the needs of pupils with hearing impairment. The qualified teachers could work with hearing impaired pupils in helping them learn mathematical skills and further more identify areas of potential difficulty and generate strategies to assist hearing impaired pupils learn mathematical skills.

It is worth noting that there are different types of teachers such as, trained graduate teachers with mathematics as a specialty, trained graduate teachers with mathematics as a second subject, graduate teachers in mathematics without teacher training and non-graduate teachers with teacher training (Diploma and Certificate holders as the cases in Zambia). Whatever they are, the worst type of teachers are those whose career are not teaching but whose interests are only to teach for their living. The teachers who are not trained to teach pupils with hearing impairment have no feelings for these pupils and have no regard for hearing impaired pupils' learning difficulties in mathematical skills.

In Zambia, through Action in Teaching English, Mathematics and Science (AIEMS, 1994) program, a survey was conducted on the teaching of Mathematics, English and Science. The results identified one factor contributing to problems in mathematics. The problem was not only the high proportion of unqualified mathematics teachers but also the lack of well qualified specialized teachers. This view was also observed by Wright et al. (2002) report in England and Wales in which they argued that the teaching of mathematics in schools has for many years suffered through an acute shortage of qualified teachers. This view is in line with Coates and Mittler (1989) who are quoted to have claimed that research suggests that the teachers with little experience of teaching pupils with hearing impairments are likely to have negative attitudes in teaching mathematical skills to pupils with hearing impairments.

3.4 Instructional Strategies used to teach mathematical skills to pupils with hearing impairments

In order for teachers to apply their teaching methods effectively, they need to know what hearing impaired pupils already know, different pupils' learning abilities and needs, what pupils find difficult and why it is difficult. As teachers of lower basic classes find themselves teaching pupils with varying mathematical backgrounds, it is proper that they employ different strategies that would assist all hearing impaired pupils learn better mathematical skills.

Olivia and Bernard (2008), in Samara (2005) carried out a research in Foundational Mathematics in the United States of America which involved 40 Low Income Children entering Pre-School and 40 High Income Children also entering Pre-School. About 67% Low Income Children could count verbally up to 5 and almost 50% could count up to 10. About 40% could count small

groups of objects (2 – 7). About 70% of High Income children could identify prototypical examples of Squares, Triangles and Rectangles. Examples of children in grade one is similar. For example, 58% entering grade one can count higher than many traditional curriculum have as their goal for the end of the year. This view is supported by NCES (2006), which indicates that children from higher income can make patterns, read numerals, recognize shapes and use nonstandard units of measurements. Almost all, thus about 94%, can count up to 10. Such findings indicate that Foundational Mathematical knowledge begins during infancy and undergoes extensive development over the early childhood years. Unfortunately, children's potential for learning mathematics is not well realized for many years in the United States of America. This is so because even before starting kindergarten, most children know substantially less about mathematics than children from other countries.

Further, children from low income communities in the United States of America have the least knowledge of any group studied. This is probably due to the lack of everyday opportunities they have to learn mathematics in their homes and school environment. It is important, however for teachers to use different types of methods to help children understand the concepts and parents should always be ready to reinforce at home (Guberman, 2004). Better mathematics can and should begin early. High – quality education results in learning benefits into Basic School education, including in mathematics (Griffin, 2004).

Research into school age children's mathematics knowledge, at times, incorporates a teaching component aimed at supporting or improving children's learning. Reys, et al (1999) described an intervention program designed to enhance the cognitive development of 5 to 7 year olds.

According to Reys, et al, the intervention was delivered partly through the context of mathematics and partly through an existing Year 1 intervention focused on Piaget's concrete operation stage. The intervention schools were in lower SES area and had a distribution of cognitive development that was below the national average while the average in the control schools was somewhat above the national average. Detailed descriptions were made of each lesson, what the teacher did and said, and what problems were observed. Results indicated that the portion of 7 – year children with 'mature concrete ability' was increased to be equal to or higher than that of the control schools.

Classroom reality, therefore, must accommodate the child's inner reality, as well as provide an external environment that enables the child to build a mental bridge to the experienced world. The teacher should make use of activities in the mathematics classroom that enable children to control their own learning and to confront their own needs. The teacher should also make use of the children's engagement in order to observe and learn about the child's understanding and needs (Leslie et al., 1990).

Gersten et al. (2005: 84) also examined the effectiveness of a program designed to improve the numeracy of young children that used number books and board games with pairs of children. The One hundred and Fifty One 5 – year old children (86 boys and 65 girls) involved in the program attended 6 low socioeconomic schools in New Zealand and scored on the lower two thirds measures of numeracy. The children were ethnically diverse (48% Europeans; 44% Maori; 4% Pacific Islanders and 4% other ethnicity).

Significant programme effects were found between comparison of pre and post measures but diminished over time as the following effect sizes revealed: 1.99 end of intervention; 1.12 six months after intervention; 50 – fifteen months after intervention. According to Gersten, et al. (2005), suggested that this washout might be because the teachers were 'still committed to' a waiting for readiness philosophy, they did not capitalize on the enhanced numeracy learning of their pupils even though the researcher had shown them what children were capable of by the end of the programme. Furthermore, he indicates that the design of the study did not allow her to tease out the effect of literature verses the games. This fact is supported by Sophia (2004) who states that many of the difficulties that children experience in school are caused by inadequate conceptual understanding of units. Sophia further, developed a programme for 3 and 4 year olds in head start programs in the United States of America. The curriculum reflected what she termed as a prospective developmental approach and focused on 'familiarizing children with the concept of unit.' The curriculum had a heavy 'measurement' orientation but also include work in Geometry. Forty – six children (25 boys and 21 girls) participated in two instructional segments that ran from September to December and from February to May. Pre and post test scores using the relevant components of the Developing Skills checklist and an instrument designed for the study were obtained for the participants and for a comparative group. Although significant program effects were found, the effect sizes (0.08 and 0.09) were quite modest, especially considering the possible washout effects experiences by other interventions.

Fuso, et al. (2006) support Gersten et al. (2005) by reporting on a year - long classroom teaching experiment in two Latino low SES urban First Grade classrooms (one English speaking and one Spanish) where teachers – researchers sought to support thinking of 2 digit quantities as tens and

ones. The instruction was based on a constructivist view of learning and Vygotskian view of teaching and learning where assistance included using activities that enabled children to construct knowledge. The teacher – researcher's role was to set problem activities, enable discussion of solutions, monitor and assess progress, initially model or lead knowledge building, and gradually withdraw support. Data consisted of notes about learning and samples of errors made on homework and class work and end –of-year interviews. Fuso et al. (2006) results indicated that there were many different learning paths to children's understanding of place value and multi-digit addition and subtraction, rather than a unitary linear progression. Children learned mathematics with support provided much better than they ordinarily would have without this kind of support. He further indicated that children's achievement for these two grade 1 classrooms was equal to that of East Asians who typically outperform their North American peers. In fact, these pupils were performing at a level equal to the grade three pupils in the United States of America, where results were compared with the results of a large-scale assessment.

Informed by the perspective that mathematical development has its roots in children's actions, Geary (2004) hypothesized that giving physical knowledge games to low-performing, low SES First graders would enhance their logical-mathematical understanding of number as described by Piaget. Secondly, Asian teachers tend to ask computational questions that were vague. This view is supported by Ginsburg et al. (1997) who hypothesized that Asian children enter school with more fully developed informal mathematical abilities (e.g. counting, mental addition) than children from other countries, Zambia, in particular, as a result of the cultural mediation practices that encourage such development early.

Ginsburg et al. (1997) drew a trans-national sample of pre-school children from China, Colombia, Japan, Korea and the United States of America representing different SES strategy. They had children pretend to attend a birthday party and had them engaged in 10 tasks – count by ones comparison of number, concrete addition, concrete subtraction, and digit span memory, finger displays of number, informal addition, informal subtraction perception of more and production from 10. Results showed that the Chinese, Koreans and Japanese children scored significantly higher than those from the United States of America and Colombia. As well, Asian children tended to be more accurate and consistent than the other children. Furthermore, Chinese children outperformed all the others, which Ginsburg, et al. attributed to the Chinese emphasis on academics. Interestingly, there was very little difference between the performance of African-American and the Caucasian American pupils, although as a group, African-American children tended to perform much more poorly than their White counterparts later in school. Ginsburg, et al. contended that this later finding challenges the fairly common notion that African-American children come to school with intellectual deficits, clearly this was not the case here as these children were performing at par with their mainstream counterparts. In an attempt to understand the role cultural practices and mathematics achievement, Guberman (2004) examined relationships between ethnicity, out-of-school activities and arithmetical performance. Forty-nine Latin American and Korean American children in grades 1, 2 and 3 in one Los Angeles working class district school were involved in the study. Data collection included:

(a) Parent's educational attitudes and beliefs

(b) Parent's reports of children's everyday activities (frequency and arithmetic complexity of activity) that provide opportunity to use money and arithmetic

(c) Children's performance in arithmetic tasks consisting of

- Problems that require summing monetary denominations and
- The same problems solved using cardboard demonstrational chips.

With both problem sets, children had to identify denominations, distinguish between absolute value and relative value (3 nickels = 15 cents) and combine various denominations. The rest scores of children with high and with low involvement with money were compared. Few differences emerged in parents' attitudes about education. Results indicated that there were differences in out-of-school activities with Latin American children more often engaged in instructional activities with money, and Korean American children more often engaged in activities with more academic focus intended to support their learning. Performance in arithmetic mirrored these activities. Latin American children solved more problems of both types. Thus, the effect on children's achievements varied by their involvement in the different activity types and that involvement was related to cultural practice differences based in ethnicity.

Mathematical research was done in Western Cultures, children were picked from two groups that is urban and suburban areas of developed nations. Within each culture, there are certain activities that are particularly meaningful to members of that society. For Aboriginal Australians, it might be counting money is a meaningful activity for children. Such cultural amplifiers have the potential of being facilitative in mathematics learning and should be identified and utilized. For example, Callaher et al. (2004) looked at 5 – 7 year old children's knowledge of money and early numeration / place value systems. They indicated that a familiar setting such as money greatly

enhanced the children's understanding of numeration and place value systems. It could be argued that learning is contextual.

Although we may create abstract objects, they flow from contextualized experiences. It is agreed that attention should be given to social dimensions of classroom learning. Whereas on the one hand knowledge is not disembodied and found in books, knowledge does not develop for an individual in isolation from others. Pupils are not lonely voyagers but learn from interaction with other children and others (Wheatley et al., 2002). This view is supported by Gergen (2001) who stated that 'knowledge is not something people possess in their heads, but rather, something that people do together.' Ideas are authenticated for each individual as a class or group develops a consensus through negotiation of meanings. The validity of mathematical knowledge is determined through interactions and the knowledge development is very much a function of the social setting within the individual exists.

Napier (1974) states that a competent teacher uses a variety of methods to help hearing impaired pupils grasp the concept of mathematical skills. Bobis (2004) states that teaching mathematical skills at lower basic school to hearing impaired pupils requires the use of different strategies and varied methods by a well-trained teacher who has been exposed, for example, the use of flash numerical cards, large and small numerical cards, counters (number concept), number line and dot pattern cards. Cornelius (1982) argues that the key to successful learning of mathematical skills among the hearing impaired pupils in lower basic classes is the teacher. The teacher has the responsibility of interpreting contents of a syllabus and other instructional materials into sign language for pupils to make sense of their classroom instructions. David (1996) states that some mathematics teachers, both specialist teachers and ordinary teachers express the view there is no

need to consider how they impart mathematical skills to hearing impaired pupils since, as it deals with universals, pupils are bound to pick up necessary skills and develop them. Mathematics is, however, viewed as socially neutral and its content is held to be independent of material world, hence the need for hearing impaired pupils to receive more systematic instructions in mathematics during their formative stages in education. Researchers such as Cockcroft (1982) have shown that teachers and pupils have problems in mathematics; it is up to the teacher to come up with strategies and a variety of teaching methods to overcome these problems. The specialist teachers need to be creative and innovative in their teaching strategies and techniques in order to help the young hearing impaired pupils grasp initial mathematical skills, concepts, operations and language necessary for future mathematical tasks. An effective teacher should also know how to select appropriate learning tools to go with different skills.

According to Doorag (1987), selection of the learning task is a critical instructional decision. No matter how excellent the teaching procedures, instruction is ineffective if the task selected is inappropriate for the learner. The selection of the learning task is even more critical for hearing impaired pupils because they may acquire new learning more slowly than the hearing.

Mager (1984) states that the breaking down of tasks into smaller sub – tasks is necessary. He further argues that when the components of the task are identified, they can be presented to hearing impaired pupils in a systematic fashion. An example of a task that can be broken down into steps is addition of two – digit numbers; first, the numbers in the ones column are added, and then the numbers in the tens column. Mercer (1987) in a supportive view states that sub-tasks allow the teacher to make decisions about the order in which skills and information will be

presented. With tasks that are sequential in nature, sub-tasks are generally taught in order in which they occur.

There is a clear consensus that effective curriculum requires the coordination of mathematics content with an understanding of the inquiry process children use to develop mathematical understandings. Bredekamp (1987) in National association for the Education of Young children (NAEYC) places emphasis on how children explore, make discoveries and solve meaningful problems.

National Council of Teachers of Mathematics (NCTM) (2000) places emphasis on what children learn when they explore, discover, and apply their understandings to solve problems. The recognition of the rules that govern how children acquire information and organize it shapes adult decisions about how to select materials and design activities and interactions. The goal of the mathematics program is to enable children to use mathematics through exploration, discovery and solving meaningful problems (Bredekamp, 1987). When the content and the curriculum are mathematically rich with concepts and procedures, (it provides) a common foundation of mathematics to be learned by all the pupils including pupils with hearing impairment (NCTM, 2000).

NCTM (2000) explains that young children learn about the content and process of mathematical learning long before adults launch instruction through a planned curriculum. Initial discoveries from infancy onwards serve as the seeds for the development of organized set of understandings. Knowledge initially takes form at the intuitive rather than the conscious level of awareness. However, before making the selection of how to teach, a teacher needs to consider the path along

which mathematical learning moves from both the process and content perspective. Curriculum begins when adults interact with children to stimulate, inform, extend their thinking and challenge them to think about new ideas.

David et al. (2008) said that teachers are committed to developing a classroom where teachers and children are passionate and robust learners. This commitment requires something more than new programs or new methods. It calls for what we can only characterize as a fundamentally different idea of what is considered "basic" to education and different disposition that permits teachers to live more generously with the children in their care. Our curriculum work demands mindful, deliberate improvisation at such moments. Children develop most fully as passionate learners when they, like all of us, are allowed to claim fully their experience of the world. Egan (1986, 1992) describes those imaginative experiences that engage, intrigue, interest, puzzle and enchant, those imaginative experiences that call forth sustained and key conversations about freedom, loyalty, responsibility, strength and human relationships.

When we speak of imaginative engagement, we mean the kind of engagement that invites children most fully, most generously into the club of knowers, not at some unspecified time in the future when they are grown up and able to use their knowledge but today and each and every day they spend with us. Egan (1992:653) notes, "to teach concrete content untied to powerful abstractions is to starve the imagination". It is important to teachers because of what it tells them about hearing each child's voice and bringing each hearing impaired child into the life of the classroom. He further states that curriculum planning that takes the voices of children seriously represents a kind of openness.

Teachers need to remain open to children's experiences in the world and construct curricula that are deeply responsive to and resonate with what each child knows, who each child is. Teachers of the hearing impaired pupils need to understand that it is only the big, authentically engaging questions that create openings wide and deep enough to admit all adventures who wish to enter. Moreover, when the hearing impaired pupils see their own questions returned to them as the basis for subsequent work and study, they come to know curriculum as a living, connected experience.

Curriculum is not delivered to them through fragmented activities made up by others, it is created with them, inspired by the work of the community of which each of them is a valued member. Bruce (1990), indicates that if we want our hearing impaired pupils to face the challenges of the twenty first century with confidence and skill, we need to teach them not only that they can acquire current knowledge, but also that they have voices that can shape what their society comes to accept as knowledge.

To help hearing impaired pupils learn how to cleave with affection, teachers cannot stand outside of it and merely instruct pupils in it. Teachers must themselves cleave with affection to those things that they wish to remember and must take on the task of showing such affection in the classroom. To teach a 'topic' a teacher must go to the place and see what becomes of them when they do, what is asked of them by the place in order to become experienced in it.

Carnegie Corporation (1998), argues that the early years have been found to be especially important for mathematics development. From the first years of life children, inclusive of the

hearing impaired, have an ability to learn mathematical skills and develop their interests in mathematics, though there hasn't been no early childhood special needs education in Zambia since the inception of Special Needs Education at the turn of the century (Katwishi, 1995). Carnegie Corporation (1998) further states that what children know when they enter Kindergarten and First Grade, predicts their mathematics achievement for years to come – even throughout their school career. Moreover, what they know in mathematics predicts their reading achievement later.

Qualified teachers therefore, are responsible for bringing the knowledge and intellectual delight of mathematics to all children, especially the hearing impaired pupils who have not yet had many high-quality educational experiences. Only good teachers can meet this challenge. A qualified teacher with some expert opinion can provide guidance on how to help children with hearing impairment learn in ways that are both appropriate and effective.

Hearing impaired pupils learn like other children. They follow natural developmental progression in learning mathematical skills and ideas in their own way. When teachers understand these developmental progressions, and sequence activities based on them, they build mathematics learning environments that are particularly developmentally appropriate and effective. These developmental paths are the basis for hearing impaired pupils to learn mathematical ideas and skills.

Kauffman (1980), stresses the need for the teacher to guide hearing impaired pupils to acquire better mathematical skills. He further states that problem solving should be introduced to hearing

impaired pupils so that they also identify the heart of mathematical problems by themselves. Karen et al. (2006) state that instructional strategies are developed to address areas of need. Teachers for the hearing impaired pupils can also decide on modifications that could be benefit all pupils with hearing impairments and ensure that learning outcomes are being met. Karen further explains that a good teacher always selects the learning tasks and breaks them into smaller tasks to help the hearing impaired pupils learn mathematical skills.

In order for teachers to assist hearing impaired pupils to achieve positive learning outcomes, they must be fully conversant with mathematics curriculum (Educating Our Future, 1996), mathematical thinking and requirements for creating holistic learning environments which facilitate mathematical learning. The knowledge of mathematics curriculum, together with an insight into specific learning styles and developmental needs of hearing impaired pupils, will reduce the factors inhibiting the learning of mathematical skills among hearing impaired pupils. Many teachers who join the teaching profession and had no knowledge about special education needs provision usually have problems in identifying children with special education needs. UNESCO cited Vaughn and Schumn (1994) who in their study established that the general education teacher in their sample did not even know who the special education pupils were until the second or third month of school. This could be attributed to the fact that many teachers seconded to special education classes to teach pupils with educational needs have no basic skills.

3.5 Learning materials and their suitability in learning mathematical skills

Bobis (2004) observed that lack of teaching and learning materials hinders hearing impaired pupils from learning mathematical skills. Whatever appropriate teaching objects a teacher may

use is as good as the teacher himself. A good and effective teacher uses concrete objects for maximum learning effect, of course depending on teacher effectiveness and special assistance.

A varied approach in teaching is more effective and learning that goes on is more usable later. Muzumara (2008) purports that an effective mathematics teacher has the ability and skills to select and use appropriate teaching and learning materials that are learner – friendly, stimulates ideas from pupils, are flexible in the use, generates interest and enjoyment for pupils. He further indicates that teaching and learning materials should be reasonably durable and readily available and easily obtainable.

Concrete objects are diversified (Copel, 1960). She further indicates that without concrete objects, whatever is being verbally taught to hearing impaired pupils will all be abstract. Hearing impaired pupils find it boring, tough and most of the time tend to dislike mathematics. It is therefore extremely important that those at lower basic, hearing impaired pupils are given the best type of teaching with the use of concrete objects in teaching mathematical skills. Cruckshank et al. (1967) also stresses the need for concrete objects. In their findings, it was reported that teachers need to use such real life natural objects familiar to the hearing impaired pupils to accelerate learning and for learning to be meaningful to pupils. It also creates interest in learners because they are dealing with the abstract. It is easier for the hearing impaired pupils to understand when real objects are used in teaching. It arouses their interest and enthusiasm to learn.

Horton (1988) postulates that quality education depends more on qualified teachers and availability of teaching and learning materials made from local resources. Chantaman (1992) points out that one area which needs a lot of attention is the provision of educational resources to the hearing impaired pupils. He further points out that special teaching facilities are required to meet the needs of exceptional children. Brenman (1985) states that children with special educational needs show greater variation in learning and to meet their needs, the teacher must have a greater variety of teaching and learning materials. If the teacher is not supported in the provision of teaching and learning materials, he/she may resent pupils with disabilities. This is the view taken by Shea and Bauer (1994) who claim that general education teachers may not be ready to meet the needs of learners with disabilities without some support.

Educating Our Future (1996) states that quality education requires the availability and use of textbooks and other educational materials. Without these aids to the learning process, effective teaching and learning in the modern sense cannot take place. Suitable materials enable pupils to acquire and apply knowledge, to learn at their own pace and to assess their own progress. Charles et al. (1983) purports that although problems of understanding mathematics differ from pupil to pupil, deafness and loss of hearing among children are believed to be the hindrance towards inability to learn mathematical skills among pupils with hearing impairments.

In teaching mathematical skills, teachers have to bear in mind that hearing impaired pupils learn better with concrete objects. The teacher believed it to be paramount for hearing impaired pupils to experience mathematical skills in a concrete and meaningful way in order to develop an understanding of mathematical concepts/processes.

Paul (1995) states that the use of mathematical resources is an area that needs further input in terms of the training of teachers of the hearing impaired pupils. He further argues that professional development should include strategies for teachers to focus on resources suitable for hearing impaired pupils in particular and the best ways of using resources to generate mathematical thinking. Teachers need to ensure that resources are supplemented with things that encourage hearing impaired pupils to look with new eyes, to see things afresh, to begin a different cycle of exploration. Some resources might also focus on things that children have at home, many of the things that hearing impaired pupils are excited and stimulated by are special to them. This statement is supported by Napier (1974) who argues that a competent teacher is one who uses a variety of approaches and concrete objects to bring about success in learning mathematical skills. He further indicates that teaching and learning materials are extremely important in boosting levels of performance in hearing impaired pupils.

Skinner (1979) points out that hearing impaired pupils find out about new ideas by moving from exploration to experimentation. Children initially learn through their senses in the world of concrete objects. Direct experiences serve as the foundation for abstractions. He further indicates that children use their experimentation and feel predictions. In mathematics, when teachers present a new collection of materials, hearing impaired children natural curiosity leads them to manipulate the objects in a variety of ways to discover more about them.

Bobis (2004) states that hearing impaired pupils who have been provided with opportunities in learning mathematical skills develop self confidence in the manipulation of concrete objects. Hearing impaired pupils' knowledge results from a combination of independent experiences and

interactions with others. They manipulate materials/objects and talk with others about their perception of their experiences. The contents of their conversations influence further explorations and discoveries about patterns and relationships within and between events. The cycle of experiences between independent learning and interaction increases in breadth and depth overtime. Hearing impaired pupils' actions and interactions with others contribute to their mathematical learning (Skinner, 1979). Dienes (1960) supports the use of apparatus because, among other things, it allows children to discover concepts for themselves with minimum of direction from the teacher. This view is also supported by Piaget (1961) who indicates that at the initial stage, very concrete experience means sensory – motor experience.

Tactile experiences are most important. In this connection, our principle of abstraction implies that operations with symbols must be preceded by operations with objects. But, of course, there must be a two – way traffic between objects and symbols. It is also necessary for children to know how to interpret symbolic work, applying it to the object world.

Crunkshank et al. (1976) also stress the need for concrete objects. They state that teachers need to use concrete objects familiar to the hearing impaired pupils to accelerate learning and for learning to be meaningful to hearing impaired pupils. Real concrete objects have long been identified as enhancing the learning of mathematical skills, yet problems continue to persist. Perhaps Cockcroft (1992) could be right when he argues that mathematics is a difficult subject to teach and to learn. However, Cornelius (1982) holds a different view. He is of the view that problems in mathematics could persist as long as there are new developments in mathematics and the shortage of well qualified teachers continues as has been the case for many years.

The findings of the study indicate that inadequately qualified and seconded teachers teach pupils wit hearing impairments. However, the teachers were not competent enough to meet learning needs of the hearing impaired pupils. The findings are consistent with those of Mannigel (1992) who indicates that, to become better teachers for pupils with hearing impairments, teachers should be well qualified. He further states that to become better teachers of mathematics, it is crucial that teachers continue to broaden their knowledge of how children come to understand mathematical concepts. Problems hearing impaired pupils faced in learning mathematical skills would be overcome only if trained teachers with good skills to meet their learning needs would teach them.

3.6 Mode of Communication

Fraser (1992) defines total communication as the right of a child who is deaf (hearing impaired) to learn the use of all forms of communication available to make him/her understand the knowledge put across. This allows meaningful interaction which involves sign and spoken language between the hearing impaired and the hearing pupils. This is why teachers of the hearing impaired pupils need to be conversant with sign language in order for them to teach mathematical skills effectively. For the hearing impaired pupils to communicate with other pupils, signs (formal or informal), gestures, facial expression, body language, as well as speech are involved. These elements of communication contribute to the development of thinking – including mathematical thinking.

Siegel (1999) argues that communicating with others brings us in touch with other minds. Communication stresses the importance of being able to talk about, write about, describe and

explain mathematical ideas. This means that hearing impaired pupils should learn not only to interpret the language of mathematics but also to use sign language both in and beyond the classroom.

Learning to communicate using sign language effectively makes the world of mathematics in school more successful. It also helps and provides interaction and the investigation of ideas within the classroom as hearing impaired pupils learn in an active, silent environment (Campbell & Fulton, 2003). Strickland et al. (2002), purports that effective communication will depend on topical knowledge but also on hearing impaired being aware of how to go about sign language. Strickland et al. (2002) indicate that the basic process skill of inference involves making conclusions based on reasoning. The interesting and challenging thing about making inferences is the sign language that takes place among hearing impaired pupils. Sign language is a powerful tool for gathering and sharing information.

It is important that teachers individually and collectively value struggling hearing impaired pupils and challenge them to reach their full potential. The pupil is not a bench – bound listener, but should be actively involved in the learning process. Like anything else, the ability of the teacher is the way to successfully use collaborative learning. By arousing interest and broadening horizons, teachers can amplify the joy and curiosity that are natural parts of the teaching and learning process. For these things to happen, teachers must be masters of content and equally familiar with the characteristics of effective interactive instruction (NCTM, 2000).

To provide educational opportunities for struggling hearing impaired pupils, requires an understanding of the barriers that get in their way and having the pedagogical knowledge to open up the paths to accomplishment (Krajcik et al., 2003). The relationship between the teacher and the hearing impaired pupils should also be sound for the teacher to teach and for hearing impaired pupils to learn effectively. It is also paramount for the teacher to be well trained and totally understand and communicate with the hearing impaired pupils (Chishimba, 2007). David (1988) argues that it remains possible that if communication between the teacher and the hearing impaired pupils is lacking, it will, in a way, make the hearing impaired pupils not to learn effectively.

Hearing impaired pupils need love and care. So, for the teacher to communicate with them, they need to be tolerant and accommodating. Once the hearing impaired pupils find out that communication and interaction is not good between them and the teacher, they will tend to withdraw and lose interest in learning and most of all, dislike the teacher and mathematics. Unless ways are found to arouse interest in the hearing impaired in learning mathematical skills, some of them will back off learning and will back off society into a corner. The teacher not only has to get the hearing impaired to work together, but also to provide them with a structured situation where they have to use social skills to get the job done.

Hughes (1986) states that communication and total communication (sign language) by the teacher is introducing mathematical skills to the hearing impaired pupils, is a matter of effective transmission of what is being taught. Hearing impaired pupils are said to live in a silent world. They are cut off from the world of sound and many are never able to learn to speak through sign

language. Children suffering from hearing impairments often find themselves living in isolation from the rest of the world because of communication problems. The communication problems they face seem insurmountable. So, total communication in this context implies an approach to creating a successful and equal communication between human beings and different language perception and production (Freeland, 1989).

From the interactive review, it can be seen clearly that there are factors inhibiting the hearing impaired pupils from learning mathematical skills. The researchers who have written about the factors inhibiting hearing impaired pupils from learning mathematical skills have good reasons to why they think so. The reasons given by the same researchers for their views are paramount and highly supported by some authorities who have taken studies on the subject especially in developed countries.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.0 Overview

This chapter discusses the methodology used in this study. It presents the research design, population, and sample, sampling procedure and data collection tools used in this study. Further, data collection procedures as well as data analysis process are discussed. Furthermore, the criteria in selecting the research methods and ethical considerations are presented. The chapter ends with a summary of key issues.

4.1 Research Design

Educational research traditions vary over a broad spectrum that includes ethnographic study, case study, psychometric approaches, experimental approaches and survey methods such as descriptive survey (Lewin, 1990). He explains that educational research is cross-disciplinary with a variety of eclectic methods. He argues that educational research has "no correct method or dominant research paradigm" (Lewin 1990:47). In this respect, the present researcher chose the descriptive paradigm and its participants and in depth interview techniques as the predominant approach with some element of the quantitative paradigm to a lesser extent.

In this study, Descriptive Research Design was used because of its ability to determine and report things the way they are. The purpose of descriptive survey is also to observe, describe and document aspects of a situation as it naturally occurs (Polit, 1995). It improves direct observation where required behavior is observed in a particular setting, full time participants on the activities

being observed and interview methods, which involve face – to – face interaction between the researcher and the subjects as its methods of inquiry. According to Orodho (2009), the technique produces data that is holistic and in-depth. The study adopted the descriptive survey design according to Gay(1992) to investigate factors inhibiting the learning of mathematical skills by the hearing impaired pupils in basic schools. Descriptive survey allows researchers to gather, summarize, present and interpret information for the purpose of clarification Orodho, 2002). As the study involved teachers and pupils, both the hearing and the hearing impaired, the study fits well in the descriptive survey design. The data collected through qualitative and quantitative approaches were analyzed to help in identifying factors inhibiting hearing impaired pupils from learning mathematical skills. Examining innovations in the new era of special education required an approach with eclectic methods which enabled the researcher to modify the procedure as the need arose such as including various professionals from disciplines vital to the adequate solutions of the present research problem (Schindele, 1984). Action research also formed an integral part of the present study. There are four fundamental aspects of this process, namely; responsive, open minded observation, general tentative and strategic planning; fluid and dynamic implementation of planned action and reflection as a review and evaluation of the dynamic process by the research participants (Elliot, 1991). The approaches chosen for this study seemed natural for the type of investigation and suited the interventionist nature of the researcher's experience as present, the teacher educator and District Inspector of Schools in Ndola District – Copperbelt Province

4.2 Population

The target population for this study were all teachers for the hearing impaired and their pupils in Basic Schools and Special Education Units on the Copperbelt Province of Zambia.

4.3. Sample

In this study, the sample comprised 44 teachers of the hearing impaired pupils and 70 pupils with hearing impairments from selected schools in Ndola and Lufwanyama districts on the Copperbelt Province.

Table 4.1: Distribution of respondents by district

Type of respondent	District		Total
	Ndola	Lufwanyama	
Teachers	23 (52.3%)	21 (47.7%)	44 (100.0%)
Pupils	37 (52.3	33 (47.7%)	70 (100.0%)
Total	60 (52.6%)	54 (47.4%)	114 (100.0%)

According to Kombo and Tromp (2006), a sample can be said to be a smaller group or subset of the accessible target population which has the characteristics of a larger group or population. It is selected carefully in such a manner that it represents the whole or entire population. Kasonde-Ng'andu (2013) defines a sample as a subset of the population to be representative of the whole study population

4.4 Sampling procedure

In this study, the researcher used simple random sampling procedure to select pupils while purposive sampling procedure was employed in selecting teachers who participated in the study. Simple random sampling was used on pupils because it provided each participant in the population an equal chance to be selected as a study sample (Kombo and Tromp, 2006). Purposive sampling was employed to select the teachers because these were expected to have knowledge on the subject matter. Kombo and Tromp (2006: 82) state that the power of purposive sampling lies in selecting participants who will provide the richest information for in-depth analysis related to the central issue being studied.

4.5 Research instruments

The following instruments were used to collect the necessary data for this study: Semi-structured questionnaires and semi-structured interview schedules. The researcher's choice to use these instruments lay on the advantages each of them provided to this study which included explanatory powers, representativeness, appropriateness to ensure reliability and validity in the data produced through their usage in the study (Cohen & Marion, 1998).

4.5.1 Semi-structured questionnaires

According to Kasonde-Ng'andu (2013), it is a research instrument used in the collection of data over a large sample in more accurate manner. The need for data to be presented to the participants in the same way, form and content, it is more ideal to gather data which support the findings of the present study.

4.5.2 Semi-structured interviews

Although interviews are time consuming, they are very effective in data collection in that they enable the researcher to probe for detailed information from the respondents. According to Kasonde-Ng'andu (2013) interviews help to cross examine data collected using other research instruments such as questionnaires. Mugenda and Mugenda (1999) also argue that interviews help the research to have first-hand information from the respondents. In this way, the researcher found the interview schedule as one instrument that was vital for collecting the needed data for the study.

4.6. Scope and Limitation of the study.

The study was limited in Ndola and Lufwanyama districts on the Copperbelt Province of Zambia which include Special Schools and Special Education School Units. Problems encountered included:

- Transport to and from research areas
- Time
- Finances to support transportation and energy replenishment

The delimitation of this study was that the unit of analysis would be confined to hearing impaired pupils who are in school. This study did not account for other pupils with disabilities who have also faced challenges in the learning of mathematical skills

4.7 Reliability and validity

Traditional positivistic research methodologies have been pre-occupied with reliability at the expense of validity. Reliability of data of qualitative research is achieved by penetrating between

the words and deeds of the researched by triangulation of data from interviews and data from an obstructive observation (Vulliamy et al. 1990). Qualitative strategies tend to maximize ecological validity, which is one of the two components of external validity. This concerns the extent to which behavior observed in one context can be generalized to another.

In this study, in order to enhance reliability of the findings, the data collected were verified by using triangulation and respondent validation. This was achieved by comparing different kinds of data from different instruments to see whether they collaborated. Respondent validation was done by verifying the results with respondents and by relating the findings with the evidence from the available literature.

Some researchers over emphasize ecological validity at the expense of population validity, the second component of external validity. Spindler (1982), argues that it is better to have in depth understanding of one setting than superficial information about isolated relationships in many settings. Population validity tends to be achieved through sampling strategies to ensure that people studied are a representation of the wider population to which generalization is desired (Vulliamy et al. 1990). The study is judged reliable and valid if understanding of some portion of educational problem has been advanced by it and participants feel the study was worth doing.

In order to ensure that the findings were valid, the researcher cross-checked the respondents' responses with those of other respondents obtained by a different instrument. For instance, data collected through interviews from teachers were cross-examined with the data gathered from the teachers through the questionnaire.

4.8 Pilot study

The value of any qualitative research depends on the relevance and authenticity of data collected through varied research techniques. To ensure that adapted research instruments, procedures and other techniques to be used would meet the relevant and authenticity criteria, a field trial in two districts was undertaken in a rural and two urban schools which had conditions and populations similar to those subsequently to be used for the main study. Cohen and Marion (1998) contend that testing of research instruments before undertaking the actual research is directed at establishing the internal consistency in the questions.

Some significant problems were observed during the trial, especially from the hearing impaired pupils:

(i) Pupils spent a long time in answering the questionnaires.

(ii) Hearing impaired pupils did not understand some questions, hence they provided wrong answers.

(iii) Some hearing impaired pupils decided not to answer some questions.

(iv) Hearing impaired pupils failed to come up with appropriate answers. After the whole exercise, the instrument was sharpened further and pupils were signed on what to do in sign language.

(v) Not all pupils answered the questionnaire. The questionnaire was answered by pupils from grade four (4) to grade ten (10) to ascertain why they gave negative answers.

Some hearing impaired pupils lacked sign language and this made it difficult to understand the reading. The Pilot exercise of the research proved to be worthwhile in that it showed areas that

needed modification and what procedures need to be reviewed. After modifications were made, pupils were able to understand questions. The questionnaire instrument that was developed to gather qualitative data on factors inhibiting hearing impaired pupils from learning mathematics was piloted on three schools. The first school responded to the questionnaire on time. The second school attempted to respond but failed due to poor understanding of English. The third school failed to respond due to lack of sign language and limited vocabulary.

The questionnaire contained the following questions:

INTERVIEW GUIDE FOR HEARING IMPAIRED PUPILS

Name of School: _____

District: _____

Grade: _____

1. Is mathematics your favourite subject in school?

   (i) Yes ☐ (ii) No ☐ (iii) Not sure ☐

   If Yes, explain why

   _____

   _____

   If Not, why?

   _____

   _____

2. What mode of communication do you use to learn mathematics? Explain

_____

_____

3. How do the teachers teach you mathematics? Explain

_____

_____

4. How can teachers help you grasp mathematical concepts?

_____

_____

5. Does your school have enough learning resources?

_____

_____

6. How suitable are these learning resources in helping you learn mathematics?

_____

_____

7. What difficulties do you face when learning mathematics?

_____

_____

8. How do you overcome these problems you face in learning mathematics?

_____

_____

9. What do you think should be done to help you reduce the problems which you face in learning mathematics?

_____

_____

4.9 Data collection procedure

Since this study employed both quantitative and qualitative methods of data collection and analysis, the researcher made use of questionnaires and interviews as tools for collecting the necessary data. The questionnaires were administered by the researcher to the teachers and their pupils with hearing impairments. This instrument enabled the researcher to gather quantitative data. Interviews were also held with pupils. This aspect provided the researcher with an in-depth of understanding of the situation as presented.

Data collection is the process of gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes. The data collection component of research is common to all fields of study including physical and social sciences, humanities and business. While methods vary by discipline, the emphasis on ensuring accurate and honest collection remains the same. The goal for all data collection is to capture quality evidence that then translates to rich data analysis and allows the

building of a convincing and credible answer to questions that have been posed (https://en.wikipedia.org/wiki/Data_collection).

4.10 Data analysis

The process of evaluating data using analytical and logical reasoning to examine each component of the data provided. (http://www.businessdictionary.com/definition/data-analysis.html). It is the process of inspecting, cleaning, transforming, and modeling data for decision-making. (https://www.lynda.com/Excel-tutorials/What-data-analysis/423403/456685-4.html). The data for this study was analysed both quantitatively and qualitatively. The quantitative data was analysed using the Statistical Package for Social Sciences to generate frequency distributions, cross-tabulations, and correlations which were used in presenting and discussing the findings of the study.

The qualitative data which was gathered through interviews was anlysed using thematic analysis. Thematic analysis is a method for identifying, analyzing and reporting patterns (emerging themes) within data (Braun & Clarke, 2006). It emphasizes pinpointing, examining, and recording patterns (or "themes") within data. Themes are patterns across data sets that are important to the description of a phenomenon and are associated to a specific research question (Daly et al., 1997). The themes become the categories for analysis. Fereday and Elimear (2006). Thematic analysis is performed through the process of coding in six phases to create established, meaningful patterns. These phases are: familiarization with data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and

producing the final report. (Braun & Clarke, 2006). Therefore, the data for this study was analysed in relation to the above definitions.

4.11 Ethical considerations

There are greater ethical and professional responsibility dilemmas faced by qualitative investigations due to intrusive techniques employed in the field. The method obliges the researcher to study the fine threads of the 'back of the shop' apart from the front counter (Jamieson, et al. 1977). However, the researcher has to weigh how much privacy of individuals or institutions should be invaded and how much should be reported with confidentiality, bearing in mind the right of the researcher and the audience. Hence the actual names will not be revealed in the present research. A fine balance is aimed at being reflective in all field activities. The researched would be investigated the way the researcher would like to be investigated, thus, respecting the worth and right of individuals all the time. The subjects of the research should be made to feel enhanced rather than diminished by participating in the research (Vulliamy, et al. 1990; Jamieson, et al. 1977).

In the present study, the research participants were enhanced in various ways. For example, teachers answered questionnaires according to how they taught hearing impaired pupils mathematical skills. The hearing impaired pupils also answered according to how they learn.

CHAPTER FIVE

PRESENTATION OF FINDINGS

5.0 Overview

This chapter presents the findings of the study aimed at investigating factors that inhibit the learning of mathematical skills by the hearing impaired pupils in the classroom in Ndola and Lufwanyama districts of the Copperbelt Province. The findings are presented according to the objectives of the study. The objectives of the study were to determine factors inhibiting the learning of mathematical skills among pupils with hearing impairments; find out the mode of communication used in teaching mathematical skills to pupils with hearing impairments; assess the availability of learning and teaching material for pupils and teachers; and assess the suitability of the teaching and learning materials for pupils with hearing impairments.

5.1 Factors affecting pupils with hearing impairment from learning mathematics

The teachers respondents were asked to indicate what they perceived were the factors inhibiting the learning of mathematical skills by the hearing impaired pupils in the classroom. Table 5.1 below shows their reactions.

Table 5.1: Factors inhibiting learning of mathematical skills by gender of teachers

Factors	Gender of teachers			Total
	Male	Female	Not indicated	
Poor methodology, poor communication and learning materials	2	-	-	2
Lack of teacher confidence, poor teacher sign language and lack of clear explanation	1	-	-	1
Language barrier	9	10	1	20
Lack of specialized teachers and negative attitude of teachers towards sign language by teachers	1	2	2	5
Lack of visual aids and adequate resources books	1	2	-	3

As can be seen from the table above, most of the teachers, 10 females and nine males were of the view that language barrier was one of the major factor that inhibited the learning of mathematical skills by pupils with hearing impairments in basic schools. Generally, teachers perceived language barrier and lack of specialized teachers and negative attitudes of teachers towards sign language as being the major hindrances.

Table 5.2: Factors inhibiting the learning of mathematical skills by district

Factors	District		Total
	Lufwanyama	Ndola	
Poor methodology, poor communication and learning materials	1	1	2
Lack of teacher confidence, poor teacher sign language and lack of clear explanation	1	-	1
Language barrier	10	10	20
Lack of specialized teachers and negative attitude of teachers towards sign language by teachers	8	10	18
Lack of visual aids and adequate resources books	1	2	3
Total	21	23	44

As can be seen from table 5.2 above, respondents from Ndola and from Lufwanyama indicated that language barrier was the major factor inhibiting factor in the learning of mathematical skills among pupils with hearing impairments.

The lack of specialized teachers and negative attitude of teachers towards sign language by teachers were other factors that contributed to non-participation in mathematics skills by pupils with hearing impairments.

5.1.1 Whether it is appropriate for pupils with hearing impairment to learn mathematics

As regards to whether it is appropriate for pupils with hearing impairments to learn mathematical skills, the reactions from the teachers were as shown in Table 5.3.

Table 5.3: Teachers' views on whether pupils with hearing impairments should learn Mathematical skills

Response	District		Total
	Lufwanyama	Ndola	
Yes; because mathematics is essential in everyday life	20	22	42
Yes; as long as teachers clearly express the steps in sign language	1	-	1
Yes; it will help them in future in high school and tertiary education	-	1	1
Total	21	23	44

The findings showed that nearly all the 42 teachers were of the view that pupils with hearing impairments should learn mathematics as it was essential in their daily lives while one respondent said that it was necessary for their future use in high school and tertiary education. This response shows how important it is for hearing impaired pupils to learn and understand mathematical skills taught to them and how useful mathematics is in their daily lives.

5.1.2 Why pupils with hearing-impairments should learn mathematical skills

In terms of why pupils with hearing impairments should learn mathematics, the teachers' reactions to this question were: 35 of them indicated that these pupils needed mathematical skills for counting in their daily activities while four were of the view that pupils needed mathematical skills in order to match with the ever changing world of technology. Further, three of the teachers

indicated that pupils with hearing impairments required mathematical skills as it was one of the requirements for entry into tertiary education. However, two (2) respondents did not react to this question.

5.1.3 Ways of improving the teaching of mathematical skills to pupils with hearing impairments

Teachers were asked to state how the teaching of mathematical skills to pupils with hearing impairments could be improved. The majority of them, 22 indicated that it would only be improved if enough learning and teaching materials, and trained teachers were availed to the pupils while nine (9) of the teachers felt that it could be improved through the use of concrete teaching aids. However, six (6) of the teachers were of the view that it would only improve on sign language as a way of enhancing communication while four (4) of them said it would improve through developing unique sign language for teaching mathematical skills. Only one teacher stated that the teaching of mathematics could be improved through developing if a unique mathematics syllabus for the hearing impaired pupils. However, two of the teachers did not react to the question.

5.2 Instructional strategies used in teaching mathematical skills to pupils with hearing impairments

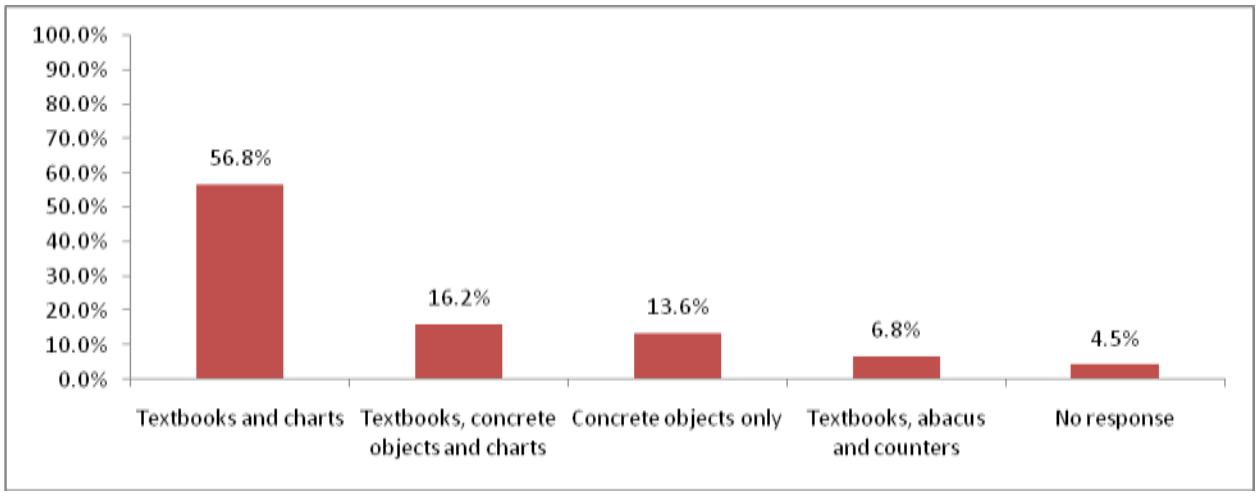
As regards instructional strategies used in teaching mathematics to the hearing impaired pupils, the majority of the teachers, 27 indicated that they used demonstrations, question and answer. This was followed by seven (7) of them who said that they used concrete objects while four (4)

of the teachers indicated that they used sign language in conjunction with visual aids. Six (6) respondents did not react to this question.

5.3 Type of teaching resources available for teaching mathematical skills to pupils with hearing impairments

Respondents were asked to indicate the type of available resources for teaching mathematics to the hearing impaired pupils. Their responses were as shown in Figure 5.1 below.

Figure 5.1: Type of resources available for teaching mathematics (n = 44)



The data from the figure above shows that the majority, 25 of the teachers indicated that they used textbooks and charts. This was followed by eight (8) teachers who indicated that they used textbooks, concrete objects and charts while six (6) of them said that they used concrete objects only. Further, three (3) of them indicated that they used textbooks, abacus and counters whereas two respondents did not react to this question.

5.4 Teachers' views on suitability of the resources in enhancing the learning of mathematical skills among the hearing impaired pupils

As regards suitability of the available resources, Most of the respondents, 17 out of 70 said the books were not suitable for teaching of the hearing impaired as they were not presented in the form of concrete objects while eight (8) of the respondents indicated that the resources available were not suitable for the hearing impaired as the materials presented in the books kept on changing now and then. However, five (5) respondents were of the view that the available resources were suitable as they were made according to grade levels while three (3) of them said that the resources were suitable but did not illustrate how they should be used. Two (2) of the respondents were of the view that the available resources were suitable but not enough whereas seven (7) respondents did not react to this question.

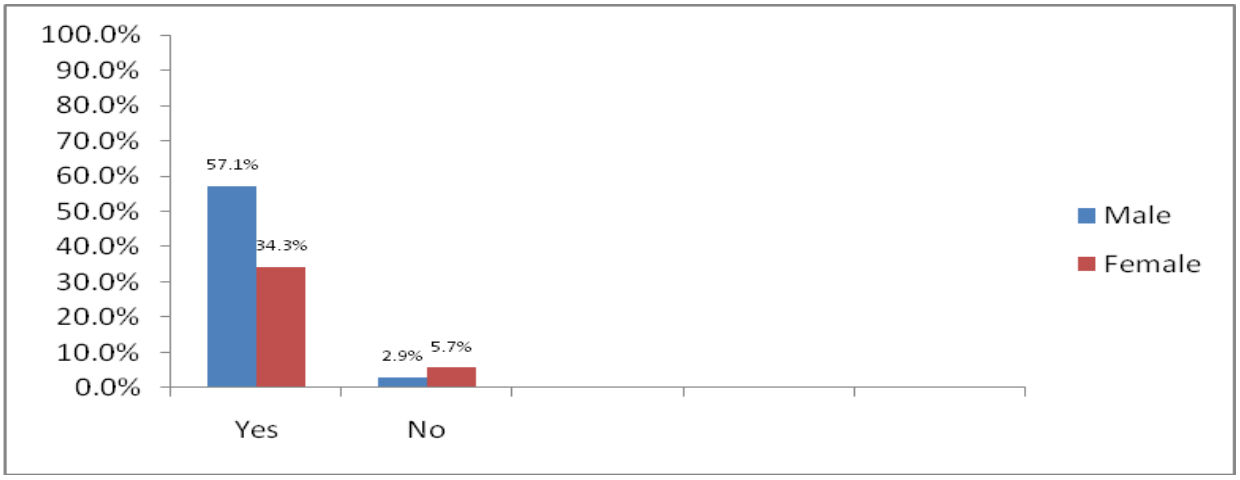
5.5 Findings from the pupils

In order to examine factors inhibiting the learning of mathematical skills among the hearing impaired pupils in Basic Schools in Zambia, data was collected from the pupils. The findings are presented below.

5.5.1 Pupils' responses on whether they were interested in learning mathematical skills

As regards to whether the pupils were interested in learning mathematical skills, their responses were as shown in figure 5.2.

Figure 5.2: Whether pupils were interested in learning mathematics (n = 70)



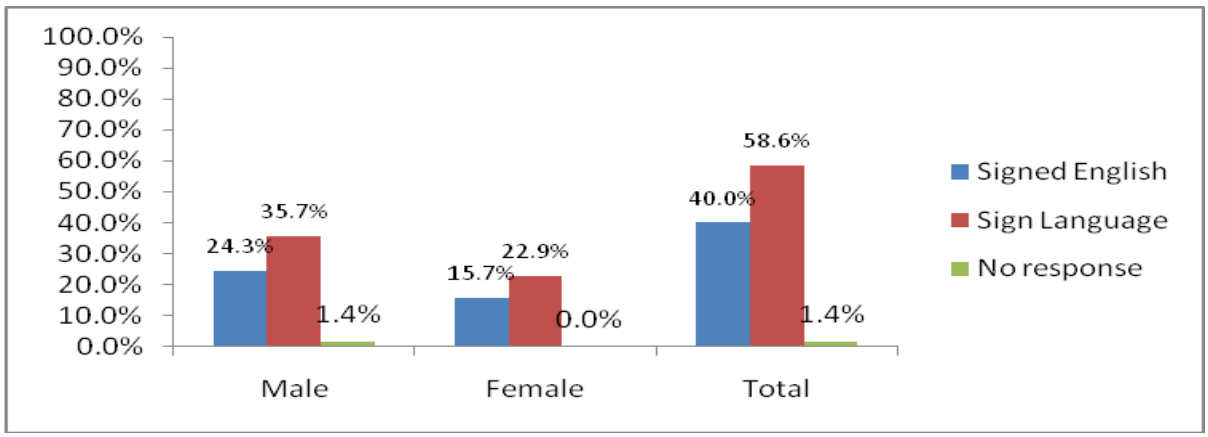
As can be seen from the figure above, the majority of the pupils, 40 males and 24 females indicated that they were interested in learning mathematics. Only a small proportion (6) of both male and female pupils said they that they were not interested in learning mathematics.

For the respondents who said that they were not interested in learning mathematics, a follow up question was asked to them to indicate why they were not interested in the subject. All the six (6) pupils, two (2) males and four (4) females said that the subject was very difficult.

5.5.2 Pupils' responses on the mode of communication they used to learn mathematical skills and gender

The pupils were asked to indicate the method of communication they used to learn mathematics. Their responses by gender were as shown in Figure 5.3.

Figure 5.3: Mode of communication used by gender (n = 70)



The figure above shows that 41 of the pupils indicated that they used sign language whereas 28 of them stated that they used signed English as the mode of communication during the process of learning mathematical skills. However, one pupil did not respond to this question.

5.5.3 Pupils' responses on the mode of communication they used to learn mathematical skills and grade level

As regards mode of communication, taking into consideration the grade level of the pupils, the study revealed the following as shown in Table 5.4.

Table 5.4: Pupils' responses on the mode of communication used in learning mathematical skills by grade level

Grade	Mode of communication used			Total
	Signed English	Sign Language	No response	
Grade 3	-	2	-	2
Grade 4	-	4	-	4
Grade 5	5	3	-	8
Grade 6	4	-	-	4
Grade 7	8	7	-	15
Grade 8	3	10	-	13
Grade 9	5	8	-	13
Grade 11	-	1	-	1
Grade 12	2	6	1	9
Not indicated	1	-	-	1
Total	28	41	1	70

As can be seen from Table 5.4 above, most of the pupils from grades 8 and 9, represented by 10 and 8 respectively indicated that the mode of communication that was used in learning mathematical skills was sign language while some pupils from grades 5 and 7, represented 5 and 8 respectively, said that they used signed English. The least, two grade 3 and one grade 11 pupils, indicated that sign language was used as the mode of communication when learning mathematical skills.

5.5.4 Pupils' responses on the mode of communication used to learn mathematical and school

As regards the mode of communication used to learn mathematics in the schools under study, the table below shows the responses from the pupils in their respective schools.

Table 5.5: Pupils' responses on the mode of communication used in learning mathematical skills by school

School	Mode of communication used			Total
	Signed English	Sign language	No response	
St. Josephs School for the Deaf	11	12	1	24
Kansenshi Basic	4	16	-	20
Kamba Basic	-	12	-	12
Chilengwa Basic	13	1	-	14
Total	28	41	1	70

Table 5.5 above shows that 12 from St. Joseph School for the Deaf; 16 from Kansenshi; and 12 from Kamba Basic School indicated that they used sign language while 13 pupils from Chilengwa Basic School said that they used signed English.

5.5.5 Pupil's responses on the teaching methods used by teachers to teach them mathematical skills

Pupils were asked to say how teachers taught them mathematics. Their reactions by grade were as shown in Table 5.6 below.

Table 5.6: Frequency distributions on teachers' method of teaching mathematical skills as perceived by pupils by grade

Grade	Method of teaching	
	Just explain in sign language	Use learning aids, books and sigh language
Grade 3	2	-
Grade 4	4	-
Grade 5	6	2
Grade 6	3	1
Grade 7	14	1
Grade 8	-	13
Grade 9	5	8
Grade 11	1	-
Grade 12	8	1
Not indicated	1	-
Total	44	26

Table 5.6 shows that most of the pupils, 14 in grade 7 reported that teachers used explanations in sign language to teach mathematical skills to the pupils. However, among the grade 8 pupils,

most of them, 13 said that teachers used learning aids, textbooks and sign language when teaching them mathematical skills. Further, among the grade 9 pupils, eight also indicated that teachers used teaching aids, textbooks and sign language when teaching then mathematical skills whereas five of them said that teachers "just" explained the concepts in sign language.

5.5.6 Pupils' responses on the methods teachers used in teaching mathematical skills and school

As regards the methods used in teaching mathematics in the schools under study, the findings revealed the following as shown in Table 5.7 below.

Table 5.7: Teaching methods used by teachers in teaching mathematical skills as perceived by the pupils by school

School	Methods of teaching		Total
	Just explain in sign language	Use learning aids, books and sigh language	
St. Josephs School for the Deaf	22	2	24
Kansenshi Basic	-	20	20
Kamba Basic	12	-	12
Chilengwa Basic	10	4	14
Total	44	26	70

As can be seen from the table above, more than half the pupils, 44 out of 70 indicated that teachers just explain in sign language while 26 of them said teachers used learning aids, books and sign language when teaching mathematics.

To supplement the cross tabulation statistics, a correlation was performed to test the degree of association between some variables. Table 5.8 shows the results of the test.

Table 5.8: Correlation between variables (indicated after the table)

Variable		How do teachers teach you mathematics?	How can teachers help you grasp mathematical concepts?	Does your school have enough resources?	How suitable are the resources in helping you learn mathematics?	What difficulties do you face in learning mathematics?
How do can teachers help you grasp mathematical concepts	Pearson Correlation	1	.			
	Sig (2-tailed)					
How can teachers help you grasp mathematical concepts?	Pearson Correlation	.794**	1			
	Sig (2-tailed)	.000				
Does your school have enough resources	Pearson Correlation	.388**	.224	1		
	Sig (2-tailed)	.001	.062			
How suitable are the resources in helping you learn mathematics	Pearson Correlation	-.078	-.089	.108	1	
	Sig (2-tailed)	.523	.465	.373		
What difficulties do you face in learning mathematics	Pearson Correlation	-.518**	-.484**	-.208	.098	1
	Sig (2-tailed)	.000	.000	.084	.421	

** Correlation is significant at the 0.01 level (2-tailed).

The study looked at two variables, independent and dependent. Dependent variables include; hindrances to effective learning, the level of training of teachers to teach hearing impaired pupils, how suitable teaching and learning resources are and methodologies used. Independent variables include; effective learning of hearing impaired pupils, effective use of sign language and their academic performance.

The results showed that there is a positive association between school resources and the teaching methods, p = .388; r = .001. The table also shows that there is very high association between how teachers can help pupils grasp mathematical concepts and how teachers teach mathematics;

p = .794; r = .000.

5.5.7 How teachers can help pupils with hearing impairments grasp mathematical concepts

Pupils were asked to state what teachers should do to help them grasp mathematical concepts. Figure 5.4 below shows their responses.

Figure 5.4: How teachers can help pupils grasp mathematical concepts by gender

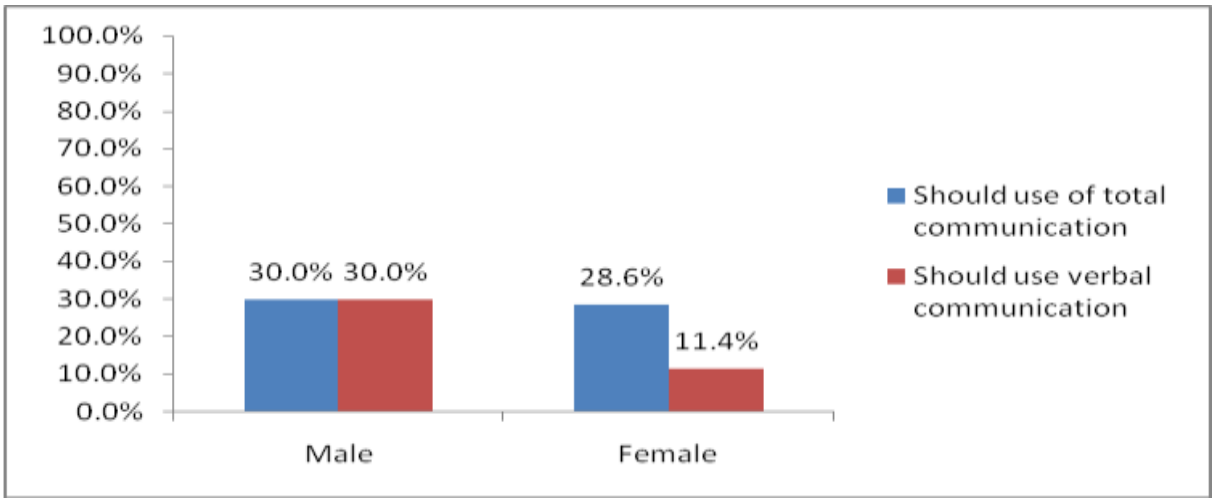


Figure 5.4 shows that most of the male, 21 and female, 20 indicated that teachers should use total communication in order to help them grasp mathematical concepts while 30.0% males and 11.4% females were of the view that using verbal communication would help them grasp mathematical concepts.

5.5.8 How teachers can help pupils with hearing impairments grasp mathematical concepts by grade level of pupils

As to how teachers can help pupils grasp mathematical skills, Table 5.9 below shows the reactions to this question by pupils by grade level.

Table 5.9: How teachers can help pupils grasp mathematical concepts by grade

Grade	How teachers could help		Total
	They should use total communication	They should use verbal communication	
Grade 3	2	-	2
Grade 4	4	-	4
Grade 5	6	2	8
Grade 6	1	3	4
Grade 7	13	2	15
Grade 8	1	12	13
Grade 9	6	7	13
Grade 11	-	1	1
Grade 12	7	2	9
Not indicated	1	-	1
Total	41	29	70

Table 5.9 shows that most of the grade 7 pupils, 13 out of 70 indicated that teachers should use total communication while most of the grade 8 pupils, 12 of them were of the view that teachers should use verbal communication as a way of helping them to grasp mathematical concepts. On the other hand, an equal number of grade 9 and grade 12 pupils represented by 7 and 7 respectively said that teachers should use total communication and verbal communication when teaching mathematics as a way of helping them grasp mathematical concepts.

5.5.9 How teachers can help pupils with hearing impairments grasp mathematical concepts

As regards pupils reactions on how teachers could help them grasp mathematical concepts, the findings of the study revealed the following as shown in Table 5.10 below.

Table 5.10: How teachers could help pupils grasp mathematical concepts by school

School	How teachers could help		Total
	They should use total communication	They should use verbal communication	
St. Josephs School for the Deaf	21	3	24
Kansenshi Basic	1	19	20
Kamba Basic	12	-	12
Chilengwa Basic	7	7	14
Total	41	29	70

As can be seen from Table 5.10, 24 out of 70 indicated that teachers should use total communication while 29 of them said that they should use verbal communication. However, at St. Josephs, most pupils, 21 were of the view that teachers should use total communication if they were going to help them grasp mathematical concepts while only 3 of them said teachers should use verbal communication. However, at Kansenshi Basic School, the reverse was the case; most pupils, 19 indicated that teachers should use verbal communication instead of total communication. The rest of the results are as shown in Table 5.10.

5.5.10 Pupils' views on availability of resources for teaching mathematical skills to pupils with hearing impairments and school

Pupils were asked to show whether their respective schools had enough resources for learning mathematics. Their responses were as shown in Table 5.11.

Table 5.11: Pupils' views on availability of teaching resources for pupils with hearing impairments by school

School	Yes	No	Total
St. Joseph School for the Deaf	20	4	24
Kansenshi Basic School	-	20	20
Kamba Basic School	-	12	12
Chilengwa Basic School	11	3	14
Total	31	39	70

As can be seen from Table 5.11, most of the pupils, 39 out of 70 indicated that their schools did not have enough resources for learning mathematics while 31 of them said the resources were adequate enough. The large proportion of pupils who said they had enough resources were from St. Joseph School for the Deaf, representing 20 of the total sample.

5.5.11 Pupils' views on availability of teaching resources for pupils with hearing impairments by school and grade level

As regards availability of resources according to grade level, the study showed the following as shown in Table 5.12.

Table 5.12: Pupils views on availability of resources to teach the hearing impaired pupils by grade level

Level	Whether teaching resources were available		Total
	Yes	No	
Grade 3	-	2	2
Grade 4	1	3	4
Grade 5	5	3	8
Grade 6	4	-	4
Grade 7	8	7	15
Grade 8	-	13	13
Grade 9	5	8	13
Grade 11	1	-	1
Grade 12	6	3	9
Not indicated grade	1	-	1
Total	31	39	70

Statistics from Table 5.12 shows that 13 of the pupils in grade 8 and 8 of them in grade 9 said that resources were not enough whereas 8 grade 7 and 6 grade 12 pupils indicated that their schools had enough learning resources. The rest of the responses are as shown in the table above.

5.5.12 Pupils' views on suitability of the available resources for learning mathematical skills to pupils with hearing impairments and gender

Pupils were further asked to indicate how suitable the resources were in helping them learn mathematics. Their reactions by gender were as shown in Table 5.13 below.

Table 5.13: Pupils views on suitability of available resources by gender

Suitability	Gender		Total
	Male	Female	
Very suitable and are easily understood by the pupils	13	13	26
The books are difficult to study and understand on your own	29	14	43
No response	-	1	1
Total	42	28	70

As shown in Table 5.13 above, more than half, 43 out of 70 pupils said that the books were difficult to study and understand on their own while 26 of them indicated that the resources were suitable and could be easily understood by the pupils. Only one (1) respondent did not react to this question.

5.5.13 Pupils' views on suitability of the available resources for learning mathematical skills among pupils with hearing impairments and grade level

As regards findings on suitability of resources, taking into account the grade levels of the pupils, the following emerged as shown in Table 5.14 below.

Table 5.14: Pupils' views on suitability of resources by grade level

Level	Views			Total
	Very suitable and are easily understood by the pupils	The books are difficult to study and understand on your own	No response	
Grade 3	2	-	-	2
Grade 4	3	1	-	4
Grade 5	4	3	1	8
Grade 6	3	1	-	4
Grade 7	8	7	-	15
Grade 8	1	12	-	13
Grade 9	2	11	-	13
Grade 11	-	1	-	1
Grade 12	3	6	-	9
Not indicated	-	1	-	1
Total	26	43	1	70

The findings shown in Table 5.14 indicate that most grade 8 pupils, 12 out of 70 and grade 9 representing 11 of them said that the resources available were not suitable as the books were difficult to study and understand by an individual pupil. In grade 12, the situation was the same with 6 of the pupils indicating the statement. However, 8 grade 7 and 4 grade 5 pupils said the resources available were very suitable as they could be easily understood by the pupils. The rest of the responses were as shown in the table above.

5.5.14 Pupils' views on suitability of the available resources for learning mathematical skills among pupils with hearing impairments and school

In terms of how suitable the available resources were in schools, the findings of the study showed the following as shown in Table 5.15 below.

Table 5.15: Pupils' views on suitability of available resources by school

School	Views			Total
	Very suitable and are easily understood by the pupils	The books are difficult to study and understand on your own	No response	
St. Joseph School for the Deaf	7	17	-	24
Kansenshi Basic	1	19	-	20
Kamba Basic	11	-	1	12
Chilengwa Basic	7	7	-	14
Total	26	43	1	70

As can be seen in Table 5.15, Kansenshi Basic and St. Joseph School for the Deaf, represented by 19 and 17 out of 70 indicated that the available resources were not suitable because books were difficult to study and understand by the pupils on their own. However, at Kamba Basic School, 11 of the respondents said that the available resources for teaching mathematics were very suitable and could be easily understood by the pupils. The rest of the responses were as shown in the table above.

5.5.15 Pupils' responses on difficulties they faced in learning mathematical skills

As regards the difficulties which pupils were faced with in learning mathematics, Table 5.16 below shows their responses according to gender.

Table 5.16: Difficulties faced in learning mathematics by gender

Responses	Gender		Total
	Male	Female	
We fail to understand mathematical concepts because teachers do not give proper instructions in sign language	22	11	33
We lack adequate books to use for homework	20	17	37
Total	42	28	70

The table above shows that most male pupils, 22 out of 70 indicated that they faced difficulties in learning mathematics because teachers did not give them proper instructions in sign language while most female pupils, 17 out of 70 said that they lacked adequate books to use for

homework. Generally, the findings showed that pupils lacked adequate books to use for home work, representing 37 of the total sample of 70.

5.5.16 Difficulties that pupils faced in learning mathematical skills and grade level

As regards the difficulties pupils faced in learning mathematics taking into consideration their grade levels, the following emerged as shown in Table 5.17 below

Table 5.17: Difficulties faced by pupils in learning mathematics by grade level

Level	Difficulties faced in learning mathematics		Total
	We fail to understand mathematical concepts because teachers do not give proper instructions in sign language	We lack adequate books to use for homework	
Grade 3	-	2	2
Grade 4	1	3	4
Grade 5	-	8	8
Grade 6	-	4	4
Grade 7	2	13	15
Grade 8	13	-	13
Grade 9	9	4	13
Grade 11	1	-	1
Grade 12	7	2	9
Total	33	37	70

The information in Table 5.17 shows that most grade 7 pupils, 13 out of 70 indicated that the difficulties they faced in learning mathematics were associated with lack of adequate books to use for homework while another 13 pupils among grade 8, said they failed to understand mathematical concepts because teachers do not give proper instructions in sign language. On the other hand, 9 grade 9 pupils and 7 grade 12 pupils incriminated teachers for failure to give proper instructions in sign language whereas 8 grade 5 pupils attributed the difficulties they faced to lack of adequate books to use for homework. For the rest of the findings see the table above.

5.5.17 Difficulties that pupils with hearing impairments faced in learning mathematical skills and school

As regards difficulties faced in learning mathematics by school, the following emerged as shown in Table 5.18.

Table 5.18: Difficulties faced in learning mathematics by school

School	Difficulties faced		Total
	We fail to understand mathematical concepts because teachers do not give proper instructions in sign language	We lack adequate books to use for homework	
St. Joseph School for the Deaf	12	12	24
Kansenshi Basic	20	-	20
Kamba Basic	-	12	12
Chilengwa Basic	1	13	14
Total	33	37	70

The table above shows that Kansenshi Basic School indicated that the most difficulty that they faced was that pupils failed to understand mathematical concepts because teachers do not give proper instructions in sign language, represented by 20 while at Chilengwa Basic School it was revealed that the most difficulty they faced in learning mathematics was lack of adequate books to use for homework, represented by 13. However, at St. Joseph, it was found out that pupils fail understand mathematical concepts because teachers do not give proper instructions in sign language and that they lack adequate books to use for homework.

5.5.18 Pupils responses on how they overcome problems they faced in learning mathematical skills

As regards how pupils overcome the problems they faced in learning mathematical skill, their responses by gender were as shown in Table 5.19.

Table 5.19: How pupils overcome the problems faced in learning mathematical skills by gender

Ways	Gender		Total
	Male	Female	
We have remedial lessons with mathematics teachers	34	26	60
Mathematical concepts are reinforced by the mathematics club	8	2	10
Total	42	28	70

From the data in Table 5.19, the findings shows that, 34 male and 26 female out of 70 pupils indicated that they overcome the problems faced in learning mathematics through remedial

lessons with mathematics teachers while 8 male and 2 female pupils said they overcome the problems they faced through reinforcement of mathematical concepts by the mathematics club.

5.5.19 How pupils overcome the problems they faced in learning mathematical skills by grade level of pupils

On how pupils overcome the problems they faced in learning mathematics, taking into account their grade levels, the study showed the following as shown in Table 5.20.

Table 5.20: How pupils overcome the problems they faced in learning mathematical skills by grade level

Ways	Ways of overcoming the problems faced in learning mathematics		Total
	Remedial lessons with mathematics teachers	Mathematical concepts are reinforced by the mathematics club	
Grade 3	2	-	2
Grade 4	4	-	4
Grade 5	8	-	8
Grade 6	4	-	4
Grade 7	13	2	15
Grade 8	13	-	13
Grade 9	11	2	13
Grade 11	-	1	1
Grade 12	4	5	9
Not indicated	1	-	1
Total	60	10	70

Table 5.20 shows that most of the respondents from grades 7, 8 and 9, representing 13; another 13; and 11 out of 70 indicated that they overcome the problems they faced in learning mathematics through remedial lessons with teachers of mathematics. As regards the grade 12 pupils, most of them, 5 out of 70 said they overcome the problems through reinforcement of mathematical concepts by the mathematics club. The rest of the responses were as indicated in the table above.

5.5.20 How pupils overcame the problems they faced in acquiring mathematical skills and school

As regards how pupils overcome the problems they face in learning mathematics, Table 5.21 below shows their responses by school.

Table 5.21: Pupils' responses on ways of overcoming the problems faced in learning mathematical skills by school

School	Ways of overcoming the problems faced in learning mathematics		Total
	Remedial lessons with mathematics teachers	Mathematical concepts are reinforced by the mathematics club	
St. Joseph School for the Deaf	14	10	24
Kansenshi Basic	20	-	20
Kamba Basic	12	-	12
Chilengwa Basic	14	-	14
Total	60	10	70

The Table 5.21 shows that the most method used at St. Joseph School for the Deaf, Kansenshi, Kamba and Chilangwa Basic Schools was remedial lessons with teachers of mathematics, represented out of 70 by 14; 20; 12; and 14 respectively. However, St. Joseph School for the Deaf also used reinforcements by the mathematics club.

5.5.21 Pupils views on what should be done to help lessen the problems they faced in learning mathematical skills

Pupils were asked to indicate what they felt should be done to lessen the problems they faced in learning mathematics. Taking gender into consideration, their responses emerged as shown in Table 5.22 below.

Table 5.22: Pupils' views on strategies to help mitigate problems faced in learning mathematical skills by gender

Strategies	Gender		Total
	Male	Female	
Teachers should give pupils more remedial/homework to supplement class work	29	22	51
Pupils should be given textbooks to practice on their own at home	10	5	15
No response	3	1	4
Total	42	28	70

The table above shows that 29 male and 22 female pupils out of 70 said that teachers should give them more remedial/homework to supplement class work whereas 10 male and 5 female pupils were of the view that pupils should be given textbooks for them to practice on their own at home.

5.5.22 Pupils views on strategies to help mitigate the problems they faced in learning mathematical skills and grade level

As regards pupils' responses on how to lessen the problem they faced in learning mathematics, taking into consideration their grade levels, the findings revealed the following as shown in Table 5.23 below.

Table 5.23: Pupils' views on strategies to lessen problems faced in learning mathematics by grade level

Level	Strategies to lessen problems faced in learning mathematics			Total
	Teachers should give pupils more remedial/homework to supplement class work	Pupils should be given textbooks to practice on their own at home	No response	
Grade 3	2	-	-	2
Grade 4	4	-	-	4
Grade 5	3	5	-	8
Grade 6	2	1	1	4
Grade 7	11	3	1	15
Grade 8	13	-	-	13
Grade 9	9	3	1	13
Grade 11	1	-	-	1
Grade 12	6	3	-	9
Not indicated	-	-	1	1
Total	51	15	4	70

From the data presented in Table 5.23, the findings of the study revealed that most of the respondents from grade 7, 8, 9 and 12, representing out of 70, 11; 13; 9; and 6 respectively said that teachers should give pupils more remedial/homework to supplement class work. However, 5 of the grade 5 pupils were of the view that pupils should be given textbooks to practice on their own at home. The rest of the responses were as shown in the table above.

5.5.23 Pupils views on strategies to help mitigate the problems they faced in learning mathematical skills and school

As regards school level, the following emerged as shown in Table 5.24.

Table 5.24: Pupils' views on strategies to help mitigate problems faced in learning mathematics by school

School	Ways to help mitigate the problems faced			Total
	Remedial lessons with mathematics teachers	Mathematical concepts are reinforced by the mathematics club		
St. Joseph School for the Deaf	12	8	4	24
Kansenshi Basic	20	-	-	20
Kamba Basic	12	-	-	12
Chilengwa Basic	7	7	-	14
Total	51	15	4	70

From the statistics in Table 5.24 above, it can be seen that the most strategy used by St. Joseph School for the Deaf, Kansenshi Basic, Kamba Basic, and Chilengwa Basic schools to mitigate the problems faced in learning mathematics was “remedial lessons with mathematics teachers” represented out of 70 by 12; 20; 12; and 7, respectively. However, St. Joseph School for the Deaf and Chilengwa Basic School also use reinforcements by mathematics club, represented by 8 and 7.

5.5.24 Pupils’ suggestions on how to improve the learning of mathematical skills among the hearing impaired

Pupils were asked to give propositions on how to improve the learning of mathematics. Of the 70 pupils, 22 were of the view that having more trained teachers in sign language would greatly improve the learning of mathematics while 17 felt that they should be provided with more textbooks in sign language. The other respondents, 6 of them said the learning of mathematics could be improved only if teachers gave them enough examples while 3 of them were of the idea that they could only improve on mathematics if it was given longer hours of teaching it. However, 5 said they had no suggestion but that they would quit mathematics as they considered it to be a difficult subject. Only one of the pupils was of the view that working in groups would improve the learning of mathematics. The rest of the pupils, 16 did not respond to the question.

CHAPTER SIX

DISCUSSION OF FINDINGS

6.0 Overview

This chapter discusses the findings of the study in relation to the set objectives and research questions of the study. The chapter begins with the discussion of the factors inhibiting the learning of Mathematical skills among the hearing impaired pupils, followed by a discussion of the nature of mathematical skills taught to the hearing impaired pupils,

6.1 Factors inhibiting the learning of Mathematical skills among the hearing impaired pupils Basic Schools

The findings of the study revealed that there were several factors that inhibited the hearing impaired from learning Mathematical skills. Most of the teachers cited negative attitude of teachers in the delivery of the curriculum due to language barrier (teacher's lack of training or knowledge in Sign Language), inadequate textbooks and visual aids, poor methodology, and lack of clear explanation of concepts by the teachers as inhibiting factors in hearing impaired pupils learning mathematical skills. On the other hand, pupils said that they failed to understand Mathematical concepts because teachers did not give them proper instructions in sign language while some of them lacked adequate textbooks to use. Further, lack of specialized teachers and negative attitude of teachers towards sign language were other factors contributing to non-participation in mathematical skills among pupils with hearing impairment. The lack of training and understanding of sign language by the teachers who teach pupils with hearing impairment is quite a saddening situation which requires immediate attention if these pupils were going to

benefit from the subject. Cornelius (1982) asserts that the key to successful learning of mathematical skills among pupils with hearing impairment is sign language. Teachers who are not conversant with sign language are unable to interpret the contents of the syllabus and instructional materials for pupils to understand.

Pupils with hearing impairment face a lot of problems in learning mathematical skills without the use of sign language as the work presented to them is always in abstract form. In order to communicate with the hearing impaired, sign language is cardinal. However, it should be appreciated that sign language and spoken language allow meaningful interaction between pupils with hearing impairment and teachers. As such, teachers teaching pupils with hearing impairment need to have adequate training in sign language so as for them to be conversant with sign language. This will enable them to use a lot of varied methods in teaching mathematical concepts, operations, and language skills effectively to these pupils

One teacher in the current study noted that without basic communication skills, pupils with hearing impairment have no idea what questions are being asked of them and what was expected of them. Pau (1995:4) suggested that 'verbal arithmetic problems contain certain linguistic forms which are particularly difficult for pupils with hearing impairment.' This sentiment requires that teachers become conversant with basic communication skills and this can only be achieved through the use of sign language. This inhibiting factor with regard to communication in learning mathematical skills among pupils with hearing impairment was also evident during observation of teachers. It became apparent that pupils with hearing impairment did not understand concepts in finding ratios and fractions they were being taught. For instance, it needed a lengthy and

repeated explanation in proper sign language from the teacher before they began to grasp the concept. This entails that a teacher teaching these pupils should be one that is well trained in sign language in order to deliver the lessons. This argument conforms to Burton (1980) who states that a teacher with limited communication skills will find problems in solving mathematical problems beyond basic level. Engaging in mathematical processes such as problem-solving, developing logic and reasoning and communicating mathematical ideas depends upon pupils' communication abilities such as observations to make predictions. This all require a sound sign language base.

Jonson (1993, cited in Davis 1996) suggests that pupils with hearing impairment would develop logical thinking when sign language skills are sufficiently developed to allow them to construct chains of casual thought. Pupils with hearing impairment abilities to successfully interpret mathematical information and use of symbols in a mathematical context would be disadvantaged by their levels of development of communication skills. Communicating mathematical ideas involves pupils with hearing impairment using their own language, that is, sign language and the language of mathematics to express mathematical ideas.

Boston (1995:159) believes that learning mathematical skills is like learning a language of mathematics features as their third or fourth language, after sign language. His idea is that the process of using more than one language to express mathematical ideas is additive in itself. Given sufficient proficiency in both languages, pupils with hearing impairment are liable to have better understanding of the concepts because they have two modes in which to think and communicate.

6.2 Nature of mathematical skills taught to the hearing impaired pupils in Basic Schools

Mathematics is a complex subject which involves among other things, evaluating pupils' strengths and weaknesses so that remedial work is immediately provided. For pupils, what they already know has some influence on their learning as some new material may not make sense without previous knowledge.

In terms of the mathematical skills taught to pupils with hearing impairment, this study showed that 61.4% of the teachers taught pupils how to add and subtract numbers while 38.6% reported that they taught these pupils how to add, subtract, multiply and divide numbers. From the above statistics it could be said that teachers mostly taught the hearing impaired how to add, subtract, multiply and divide numbers.

This finding is in line with Baroody (1987) who argues that pupils with hearing impairment need to acquire mathematical skills in reading and writing numbers, counting objects, use of the four basic mathematical operational skills, i.e. addition, subtraction, multiplication and division, and apply these skills. Unless pupils with hearing impairment are able to use these skills together independently, it may be difficult to find solutions to problems. Further, Davis (1996) states that learning mathematical skills involves reasoning, developing problem-solving skills and remembering facts about different concepts and theories (Davis, 1996).

One of the best ways to help pupils with hearing impairment learn mathematical skills is to present them with a problem in which they have to devise their own strategies to find solutions. For pupils with hearing impairment to understand basic operation skills, they need to start with simple counting strategies and develop mastery at the basic facts and eventually become

competent users of mathematical skills. Failure to develop mastery is likely to impede learning of higher order mathematical skills.

Other basic mathematical skills pupils with hearing impairment need to learn include patterning, and matching numbers with objects. Recognizing and creating patterns are fundamental to developing number concepts and relationships as this helps pupils with hearing impairment to immediately recognize how many items there are in a small group. Further, identifying qualities on dot cards can be extended to include many aspects of learning by requiring pupils to match patterns with objects. This also helps the hearing impaired to acquire the needed skills in understanding mathematical concepts. It is therefore imperative that teachers teaching mathematical concepts to pupils with hearing impairments attain a level of understanding and appreciating the use of the above approaches.

6.3 Instructional strategies used by teachers to teach mathematical skills to pupils with hearing impairments in Basic Schools

In order for teachers to apply their teaching effectively, they need to know what pupils with hearing impairment already know, different pupils' learning abilities and needs, what pupils find difficult and why they find it difficult. As teachers of basic classes find themselves teaching pupils with varying mathematical backgrounds, it is proper that they employ different strategies that would assist all pupils with hearing impairment learn better mathematical skills.

Other instructional strategies teachers used included concrete objects and sign language in conjunction with visual aids.

Bobis (2004) states that teaching mathematical skills at basic school to pupils with hearing impairment requires the use of different strategies and varied methods such as the use flash numerical cards, large and small numerical cards, counters (number concept), number line and dot pattern cards by well trained teachers.

Cornelius (1982) argues that the key to good successful learning of mathematical skills among pupils with hearing impairment is the teacher. The teacher has the responsibility of interpreting contents of a syllabus and other instructional materials in sign language for pupils to make sense of their classroom instructions. David (1996) also says that mathematics teachers, both specialist and ordinary teachers express the view that there is no need to consider how they impart mathematical skills to pupils with hearing impairment since, as it deals with universals, pupils are bound to pick up necessary skills and develop them.

As Mathematics is viewed as socially neutral and its content held to be independent of material world, there is need for pupils with hearing impairment to receive more systematic instructions in mathematics during their formative stages in education. Researchers such as Cockcroft (1982) have shown that teachers and pupils have problems in mathematics; it is up to the teacher to come up with strategies and a variety of teaching methods to overcome these problems. The specialist teachers need to be creative and innovative in their teaching strategies and techniques in order to help pupils with hearing impairment grasp initial mathematical skills, concepts, operations and language necessary for future mathematical tasks.

An effective teacher should also know how to select appropriate learning tasks to go with different skills. In supporting Cockcroft, Doorag (1987) stated that selection of learning tasks is a critical instructional decision. No matter how excellent the teaching procedures, instruction is ineffective if the tasks selected are inappropriate for learners. The selection of the learning task is even more critical for pupils with hearing impairment because they may acquire new learning more slowly than the hearing pupils.

Mager (1984) states that, the breaking down of tasks into smaller sub-tasks is necessary. He further argues that when the components of the task are identified, they can be presented to pupils with hearing impairment in a systematic fashion. An example of a task that can be broken down into steps is addition of two-digit numbers. First, numbers in the Ones column are added, and then numbers in the Tens column are added. Mercer (1987) in a supportive view states that sub-tasks allow the teacher to make decisions about the order in which skills and information will be presented. With tasks that are sequential in nature, sub-tasks are generally taught in the order in which they occur.

It may, therefore, be argued that a competent teacher is one who uses a variety of teaching strategies and methods to bring about success in learning mathematical skills among the hearing impaired pupils. Teaching mathematical skills at basic school to pupils with hearing impairment requires the use of different strategies and varied methods by a well-trained teacher who has been exposed. Effective teaching and learning goes with the use of different strategies and the use of proper teaching and learning materials.

6.4 Instructional Strategies teachers used in the teaching of mathematical skills

In order for teachers to apply their teaching effectively, they need to know what pupils with hearing impairment already know, different pupils' learning abilities and needs, what pupils find difficult and why they find it difficult. As teachers of basic classes find themselves teaching pupils with varying mathematical backgrounds, it is proper that they employ different strategies that would assist all pupils with hearing impairment learn better mathematical skills. Bobis(2004) states that teaching mathematical skills at basic school to pupils with hearing impairment requires the use of different strategies and varied methods by well trained teachers who has been exposed, for example, the use of flash numerical cards, large and small numerical cards, counters(umber concept), number line and dot pattern cards. Cornelius (1982) argues that the key to good successful learning of mathematical skills among pupils with hearing impairment is the teacher. The teacher has the responsibility of interpreting contents of a syllabus and other instructional materials in sign language for pupils to make sense of their classroom instructions. David (1996) also says that mathematics teachers, both specialist and ordinary teachers express the view that there is no need to consider how they impart mathematical skills to pupils with hearing impairment since, as it deals with universals, pupils are bound to pick up necessary skills and develop them.

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specialist teachers need to be creative and innovative in their teaching strategies and techniques in order to help pupils with hearing impairment grasp initial mathematical skills, concepts, operations and language necessary for future mathematical tasks. An effective teacher should also know how to select appropriate learning tasks to go with different skills. In supporting Cockcroft, Doorag (1987) stated that selection of learning tasks is a critical instructional decision. No matter how excellent the teaching procedures, instruction is ineffective if the tasks selected are inappropriate for learners. The selection of the learning task is even more critical for pupils with hearing impairment because they may acquire new learning more slowly than the hearing pupils.

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6.5 Availability of educational resources for teaching mathematical skills to pupils with hearing impairments in Basic Schools

As regards availability of educational resources, these were not readily available and that they were not adequate enough although in very few schools, educational resources were available and adequate especially schools run by Missionaries, for example St. Joseph School for the Deaf in Lufwanyama District.

The above findings are in line with Bobis (2004) who observed that lack of teaching and learning materials hinders hearing impaired pupils from learning mathematical skills. Whatever appropriate teaching objects a teacher may use is as good as the teacher himself. A good and effective teacher uses concrete objects for maximum learning effect, of course depending on teacher effectiveness and special assistance.

Brenman (1985) states that children with special educational needs show greater variation in learning and to meet their needs, the teacher must have a greater variety of teaching and learning materials. If the teacher is not supported in the provision of teaching and learning materials, he/she may resent pupils with disabilities. This is the view taken by Shea and Bauer (1994) who claim that general education teachers may not be ready to meet the needs of learners with disabilities without some support.

Educating Our Future (1996) states that quality education requires the availability and use of textbooks and other educational materials. Without these aids to the learning process, effective teaching and learning in the modern sense cannot take place. Suitable materials enable pupils to acquire and apply knowledge, to learn at their own pace and to assess their own progress.

Concrete objects are diversified (Copel, 1960). She further indicates that without concrete objects, whatever is being verbally taught to hearing impaired pupils will all be abstract. Hearing impaired pupils find it boring, tough and most of the time tend to dislike mathematics. It is therefore extremely important that those at lower basic, hearing impaired pupils are given the best type of teaching with the use of concrete objects in teaching mathematical skills. Whatever appropriate teaching objects a teacher may use is as good as the teacher himself/herself. A good and effective teacher uses concrete objects for maximum learning effect, of course depending on teacher effectiveness and special assistance. Therefore, a varied approach in teaching is more effective and learning that goes on is more usable later.

Educating Our Future (1996) also states that quality education requires the availability and use of textbooks and other educational materials. Without these aids to the learning process, effective teaching and learning in the modern sense cannot take place. Suitable materials enable pupils to acquire and apply knowledge, to learn at their own pace and to assess their own progress. In teaching mathematical skills, teachers have to bear in mind that hearing impaired pupils learn better with concrete objects. This aspect is paramount for hearing impaired pupils to experience mathematical skills in a concrete and meaningful way in order to develop an understanding of mathematical concepts/processes.

6.6 Suitability of the available educational resources for mathematical skills to pupils with hearing impairments in Basic Schools

In terms of suitability of the available educational resources, teachers were of the view that the books were not suitable for teaching the hearing impaired pupils because they were not presented in the form of concrete objects and also because the materials presented in the books kept on changing now and then. Like teachers, pupils also reported that the available educational resources were not suitable because the books were not in concrete form thus making it difficult for them to understand the concepts. The above revelations have greater implications on the education of the hearing impaired especially in the acquisition of mathematical skills. Researchers have advocated for materials that are suitable for the hearing impaired.

Copel (1960) argues that concrete objects are cardinal to the learning of mathematical skills among the hearing impaired scholars. Without concrete objects, whatever is being verbally taught to hearing impaired pupils will all be abstract. The hearing impaired pupils find it boring, tough and most of the time tend to dislike mathematics because of lack of adequate teaching and learning materials as alluded to in the above argument. It is therefore extremely important that those at lower basic, hearing impaired pupils are given the best type of teaching with the use of concrete objects in teaching mathematical skills.

Cruckshank et al. (1967) also stresses the need for concrete objects. In their findings, it was reported that teachers need to use such real life natural objects familiar to the hearing impaired pupils to accelerate learning and for learning to be meaningful to pupils. It also creates interest in learners because they are dealing with the abstract. It is easier for the hearing impaired pupils to

understand when real objects are used in teaching. It arouses their interest and enthusiasm to learn. Teachers need to ensure that resources are supplemented with things that encourage hearing impaired pupils to look with new eyes, to see things afresh, to begin a different cycle of exploration. Some resources might also focus on things that children have at home, many of the things that hearing impaired pupils are excited and stimulated with are special to them.

Napier (1974) also argued that teaching and learning materials are extremely important in boosting levels of performance in hearing impaired pupils. Skinner (1979) argues that hearing impaired pupils find out about new ideas by moving from exploration to experimentation. Children initially learn through their senses in the world of concrete objects. Direct experiences serve as the foundation for abstractions. He further indicates that children use their experimentation and feel predictions. In mathematics, when teachers present a new collection of materials, hearing impaired children natural curiosity leads them to manipulate the objects in a variety of ways to discover more about them. They manipulate materials/objects and talk with others about their perception of their experiences. The contents of their conversations influence further explorations and discoveries about patterns and relationships within and between events. Skinner (1979) further argue that the cycle of experiences between independent learning and interaction increases in breadth and depth overtime. Hearing impaired pupils' actions and interactions with others contribute to their mathematical learning.

Dienes (1960) supports the use of apparatus because it allows children to discover concepts for themselves with minimum of direction from the teacher. This view is also supported by Piaget (1961) who indicates that at the initial stage, very concrete experience means sensory – motor

experience. Tactile experiences are most important. In this connection, our principle of abstraction implies that operations with symbols must be preceded by operations with objects. But, of course, there must be a two – way traffic between objects and symbols. It is also necessary for children to know how to interpret symbolic work, applying it to the object world.

Crunkshank et al. (1976) also stress the need for concrete objects. They state that teachers need to use concrete objects familiar to the hearing impaired pupils to accelerate learning and for learning to be meaningful to hearing impaired pupils. Real concrete objects have long been identified as enhancing the learning of mathematical skills, yet problems continue to persist.

The fact that suitable teaching/learning materials are not readily available should not be an escape to deny mathematical skills to pupils with hearing impairment. There is, therefore, need to train teachers in 'education materials' production through improvising. Teachers of mathematical skills should, however, continue to broaden their knowledge of how children come to understand mathematical concepts. Problems hearing impaired pupils faced in learning mathematical skills would be overcome only if trained teachers with good skills to meet their learning needs would teach them.

CHAPTER SEVEN

CONCLUSION, RECOMMENDATIONS AND FUTURE RESEARCH

7.0 Overview

This chapter presents conclusion, recommendations future research drawn from the findings of the study.

7.1 Conclusion

The study has shown that there are several factors that inhibit the learning of mathematical skills among pupils with hearing impairments. Among the most prominent factor was the language barrier which denied these pupils the opportunity to learn, grasp, and understand the concepts. This resulted into pupils forgetting things easily because teachers found it difficult to explain things using sign language. Another factor was the lack of textbooks; most pupils with hearing impairment were frustrated because textbooks were not there to reinforce their learning. In some cases teachers also did not have textbooks to refer to. Learning should be an integral thing, meaning that pupils with hearing impairment will only learn mathematical skills if all areas of curriculum delivery are touched and only if total communication is used.

The current study also revealed that teachers and pupils were of the view that effective teaching to improve the learning of mathematical skills among the pupils with hearing impairment can be done through demonstrations. This method proves to be very effective because through seeing, the hearing impaired are stimulated to learn. Similarly, Atthey (2007) argues that in order for mathematics learning to be effective among the hearing impaired pupils, it should involve play

as a method. Playing is natural and is a vital tool that can enhance the learning of mathematical skills among the hearing impaired pupils.

Other factors that could stimulate the learning of mathematical skills among the hearing impaired pupils is the availability of appropriate learning and teaching materials. At times play that is not focused on mathematical concepts can be made richer by adding resources that capture pupils with hearing impairment's imagination in supporting mathematical thinking and learning.. The study further revealed that availability of relevant teaching resources would increasingly help the teacher to teach effectively. It also allows for pupils with hearing impairment to learn mathematical skills. Where need arose, there was need for the teachers to stimulate the learning process through teacher's own resourcefulness and creativity. These include wall charts to mention among others.

As regards availability of resources, the study has shown that these were not readily available and in most cases did not provide up-to-date information, making then unsuitable to the teaching and learning of mathematical skills among the hearing impaired pupils. However, it was found that where teachers have improvised, these were suitable as the teachers made sure that they were in line with the current materials in circulation.

In relation to the theoretical framework chosen for this study, Kambel (1977) argues that what pupils become before and after school depends on the relationship between the teacher and the pupil. The teacher contributes greatly to the integral growth of pupils with hearing impairment in class; the concerns and categories teachers use to define their pupils in class helps to shape the

well-being of the pupil in future. For instance, teachers who use negative terms or words such as stupid, slow learner, low achiever and poor would discourage pupils with hearing impairment from effectively learning mathematical skills. In order to make this theoretical framework relevant to pupils with hearing impairment in Zambia, the researcher notes three sources of support, namely support from classroom teachers, teachers using different types of instructional strategies, and the use of teaching and learning materials, including the use of improvised materials. Support from classroom teachers could be in form of interaction with pupils to help them acquire mathematical skills during mathematics lessons and also help them begin a different cycle of exploration in life. It has been observed that pupils with hearing impairments' actions and interactions with others contribute to their learning situation.

The second source of support was teachers using different types of instructional strategies to help pupils with hearing impairment grasp the concept of mathematical skills. The third source of support to pupils with hearing impairment was the use of teaching and learning materials. It should be noted that teaching the hearing impaired pupils without the necessary educational resources does not add value to the learning of process of mathematical skills among the hearing impaired pupils in schools. Hohmann and Weikart (2002) pointed out that this method of teaching is more or less like teaching in abstract.

According to Hohmann and Weikart (2002) children learn and discover relationships through teaching and learning materials. To this effect, the researcher realized that for pupils with hearing impairment to learn the concept of mathematical skills teachers need to use appropriate teaching and learning materials. In this regard, this study has found three major concerns in regard to the

teaching and learning of mathematical skills among the hearing impaired pupils in schools. These are: teacher interaction with the pupils, teachers making sure that curriculum content is well organized, different strategies and teaching and learning materials are used. It should be stated that guided by the current study theoretical framework, the study objectives have been achieved.

Although there were several factors that inhibited the learning of mathematical skills among the hearing impaired pupils, evidence of measures to address such factors were identified. These include the use of proper instructional strategies and the use of sign language when teaching mathematical skills to learners with hearing impairments. Further, adequate and up-to-date teaching and learning materials are essential. Furthermore, the study has shown that appropriateness of the teaching and learning materials including the methods of teaching mathematical skills are vital in the improvement of these skills among these pupils.

7.2 Recommendations

Based on the findings of the study, the following recommendations were made: The Ministry of Education should:

1. supply schools with adequate and appropriate textbooks to use by the hearing impaired pupils,
2. train more teachers in Sign Language in line with the current trends in education to supplement the current number of trained teachers in schools with special units.
3. conduct workshops for teachers handling pupils with hearing impairment as a way of changing their negative attitude in the delivery of Mathematical skills.

4. ensure that teachers continue to teach the hearing impaired pupils Mathematical skills pertaining to addition, subtraction, multiplication, and division of numbers in line with the ever changing technology.
5. continue supplying schools with appropriate instructional materials in line with the syllabi and according to grade level.
6. increase the supply of relevant educational resources in schools for the teaching of Mathematical skill to pupils with hearing impairments.
7. embark on producing educational materials for the hearing impaired pupils that are in the form of concrete objects so as to make pupils grasp Mathematical concepts easily.

FUTURE RESEARCH

Although the study has come up with factors inhibiting pupils with hearing impairment from learning mathematical skills and measures to address such factors, the results raise some questions. One of the questions is, how cognitive development affects language communication skills. Future studies should look at the relationship between language and cognitive development and determine the effects on language development in acquisition of mathematical skills.

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APPENDIX I

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY, SOCIOLOGY AND SPECIAL EDUCATION

QUESTIONNAIRE FOR TEACHERS

Name of School: _____

District: _____

1. In your view, what are the factors that inhibit the learning of mathematical skills among the hearing impaired pupils in your school?

   _____

   _____

   _____

   _____

2(a). Do you think it is appropriate for hearing impaired pupils to learn mathematics in Basic Schools?

(i) Yes ☐ (ii) No ☐ (iii) Not sure ☐

2(b) If Yes, explain why

_____

_____

_____

2(c) If Not, why?

_____

_____

_____

3. Why should pupils with hearing impairment learn mathematics in Basic Schools?

_____

_____

_____

4. In your view, how can the teaching of mathematics to pupils with hearing impairment be improved?

_____

_____

_____

5. What do you think can be done to improve the learning of mathematics among pupils with hearing impairment in Basic Schools?

_____

_____

_____

6. What instructional strategies do teachers use in teaching mathematics to pupils with hearing impairments?

_____

_____

_____

7. What types of resources are available for the teaching of mathematics to pupils with hearing impairments in Basic Schools?

_____

_____

_____

8. How suitable are the resources, if any, in enhancing the learning of mathematics among pupils with hearing impairments?

(a) Very suitable ☐

(b) Suitable ☐

(c) Not very suitable ☐

(d) Not suitable ☐

€ I am not sure ☐

Please explain your response above.

_____

_____

_____

THANK YOU FOR YOUR TIME

APPENDIX II

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY, SOCIOLOGY AND SPECIAL EDUCATION

INTERVIEW GUIDE FOR HEARING IMPAIRED PUPILS

Name of School: _____

District: _____

Grade: _____

1. Is mathematics your favourite subject in school?

(i) Yes ☐ (ii) No ☐ (iii) Not sure ☐

If Yes, explain why

_____

_____

_____

If Not, why?

_____

_____

_____

10. What mode of communication do you use to learn mathematics? Explain

_____

_____

_____

11. How do the teachers teach you mathematics? Explain

_____

12. How can teachers help you grasp mathematical concepts?

_____

_____

_____

13. Does your school have enough learning resources?

_____

_____

_____

14. How suitable are these learning resources in helping you learn mathematics?

_____

_____

_____

15. What difficulties do you face when learning mathematics?

_____

_____

16. How do you overcome these problems you face in learning mathematics?

_____

_____

17. What do you think should be done to help you reduce the problems which you face in learning mathematics?

_____

_____

THANK YOU FOR YOUR TIME

APPENDIX III

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY, SOCIOLOGY AND SPECIAL EDUCATION

QUESTONNAIRE: Pupil – Hearing Impaired

To my Esteemed Respondent,

My name is **CHRISTINE CHISHIMBA SIWALE** and I am a student at the University of Zambia. I am conducting this research in partial fulfillment of the requirement for the degree of Doctor of Education (PhD) in Special Education. The findings of this research shall not in any way be used for any purpose other than purely academic. Your responses shall, therefore, be treated with uttermost and confidentiality.

PART ONE: IDENTIFICATION DATA

Province: Copperbelt Province

District: ……

Station School: ……

PART TWO: BACKGROUND

1. What is your Sex?

   a) Male ☐

   b) Female ☐

   (**Tick where appropriate**)

2. What is your age? ……

3. At what school are you a pupil? ……..

4. In which grade are you? ……..

PART THREE: INTERVIEW GUIDE FOR PUPILS

1. Is mathematics your favourite subject in school?

   a) ☐ YES b) ☐ NO

2. If the answer is NO, what makes mathematics not to be your favourite subject?

   a) ☐ It is a very difficult subject

   b) ☐ The subject is not offered in school

3. What mode of communication do you use to learn mathematics

   a) ☐ Signed English b) ☐ Sign Language

4. How do the teachers teach you mathematics?

   a) ☐ Teachers use learning aids, books and sign language to explain mathematical concepts ☐

   b) ☐ Teachers just explain in sign language

5. How can teachers help you grasp mathematical concepts?

   a) ☐ They should use total communication

   b) ☐ They should use verbal communication

6. Does your school have enough learning resources?

   a) ☐ YES b) ☐ NO

7. How suitable are these learning resources in helping you learn mathematics?

   a) ☐ Very suitable and are easily understood by pupils

   b) ☐ The books are difficult to study and understand on our own

8. What difficulties do you face when learning mathematics?

   a) ☐ We fail to understand mathematical concepts because teachers do not give proper instructions in sign language

   b) ☐ We lack adequate books to use for homework

9. How do you overcome these problems you face in learning mathematics?

   a) ☐ We have remedial lessons with mathematics teachers

   b) ☐ Mathematical concepts are reinforced by the mathematics club

10. What do you think should be done to help you lessen the problems which you face in learning mathematics?

    a) ☐ Teachers should give pupils more remedial/homework to supplement class work

    b) ☐ Pupils should be given textbooks to practice own their own at home

NOTE: ***Give any other suggestions and / or recommendations***

……

……

THANK YOU FOR YOUR RESPONSES

APPENDIX IV

THE UNIVERSITY OF ZAMBIA

SCHOOL OF EDUCATION

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY, SOCIOLOGY AND SPECIAL EDUCATION

QUESTONNAIRE: TEACHER – SPECIAL EDUCATION

To my Esteemed Respondent,

My name is **CHRISTINE CHISHIMBA SIWALE** and I am a student at the University of Zambia. I am conducting this research in partial fulfillment of the requirement for the degree of Doctor of Education (PhD) in Special Education. The findings of this research shall not in any way be used for any purpose other than purely academic. Your responses shall, therefore, be treated with uttermost and confidentiality.

PART ONE: IDENTIFICATION DATA

Province: Copperbelt Province

District: ……

Station School: ……

PART TWO: BACKGROUND

1. What is your Sex?

   c) Male ☐

   d) Female ☐

   (**Tick where appropriate**)

2. What is your age? ……

3. How many years have you taught as a special education teacher? …….

4. What is your highest qualification?

   a) Certificate

   b) Diploma

   c) Advanced Diploma

   d) Bachelor Degree

   e) Master Degree

   (**Tick where appropriate**)

5. At which institution did you train? ……..

PART THREE: INTERVIEW GUIDE FOR TEACHERS

To ensure that research instruments are relevant to the study, a field trial in two basic schools will be undertaken in one rural and one urban schools in Lufwanyama and Ndola Districts. These schools have characteristics similar to those to be used later in the main study.

The following questions will be used in this pilot study:

1. What factors affect pupils with hearing impairment from learning mathematics in basic schools?.....

   .....

2. Do you think it is appropriate for hearing impaired pupils to learn mathematics in basic schools?.....

   .....

3. Why should pupils with hearing impairment learn mathematics in basic schools?

   ……

   ……

4. How can the teaching of mathematics to pupils with hearing impairment be improved?

   ……

   ……

5. What do you think can be done to improve the learning of mathematics among pupils with hearing impairment in basic schools?

   ……

   ……

6. What instructional strategies do teachers use in teaching mathematics to pupils with hearing impairment?.....

   ……

7. What type of resources are available for the teaching of mathematics to pupils with hearing impairment in basic schools?.....

   ……

8. How suitable are the resources, if any, in enhancing the learning of mathematics among pupil with hearing impairment in basic schools?.....

……

……

NOTE: ***The space provided should not limit your contributions but you can use extra paper for more information*****.**

THANK YOU FOR YOUR RESPONSES