UNIVERSITY OF EDUCATION, WINNEBA

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PERFORMANCE OF UPPER PRIMARY PUPILS WHO ARE DEAF IN THE BASIC MATHEMATICAL OPERATIONS AT THE UNIVERSITY PRACTICE INCLUSIVE SCHOOL, SOUTH CAMPUS, WINNEBA

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MAY, 2018

DECLARATION

CANDIDATE'S DECLARATION

I, Ruth Quaye, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: .....

DATE: .....

SUPERVISOR'S DECLARATION

I, Grace Yawo Gadagbui (Professor), hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

SIGNATURE……

DATE ……...

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DEDICATION

I dedicate this work to my late father, Mr. Kenneth Augustus Quaye, my dear husband Mr. Edwin Badu Assiampong of Swedru Senior High School and my lovely kids Kwaku, Adwoa, Kwasi and Efua.

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ABSTRACT

This study explored performance of upper primary pupils with deafness in basic mathematical operations at the University Practice South Inclusive School in Winneba. Four research questions were raised to guide the study. The approach was qualitative that employed a case study research design. Purposive and stratified sampling techniques were used to sample five (5) teachers and seven (7) pupils with deafness from the upper primary. A semi- structured interview guide and work sample analysis of pupils were used to collect data for the study. The interview for the pupils was on their performance in the basic operations and was conducted using sign language whiles the teachers were done in oral language. The instruments were pretested at Cape Coast School for the Deaf to determine a baseline and establish validity. In the actual test, pupils' class tests and end of term examinations were used to analyze their performance. Data collected were analyzed thematically according to the various themes raised in the four research questions. Findings from the study revealed that mathematics was a difficult subject by the pupils. Again, there were individual, home and school factors such as pupils' absenteeism, pupils' lack of intrinsic motivation due to the perception that mathematics was difficult, some teachers' incompetence in sign language influenced pupils' performance in the basic operations. Recommendations were that the head and teachers of the school should help eradicate the perception that mathematics is difficult. Again, teachers and pupils with deafness should improve upon their sign language skills to enable effective communication.

CHAPTER ONE

INTRODUCTION

1.0 Background to the study

Mathematics is very important in the education and development of children, because it prepares them for success in future. The purpose of teaching and learning of mathematics is not only for the success in school but also to use the knowledge acquired in mathematics in everyday activities (Utah State Office of Education, 2013). Mathematics is seen in every aspect of our life such as cooking, budgeting, shopping, building buying and selling which is part of our daily life (Stein, 2013). Mathematics enables an individual to solve daily issues for example in buying, selling and exchange of monies which involves basic operations such as addition, subtraction, multiplication and division. National Research Council of Kenya (2012) explained mathematics as a subject which is the mother of all subjects either from the arts and sciences. They continued that mathematics was seen in almost every aspect of our lives such a buying and selling, measurement in fashion, technology and economics.

Performance of learners who are deaf in the basic mathematical operations have been the subject of educational attention for many years in Ghana by many stakeholders such as teachers, parents, researchers and policy makers (GES, 2009). This is because their performance in the basic operations in mathematics shows a vast gap in achievement compared with their hearing counterpart at the same level (GES, 2009). Basic operations commonly known as basic arithmetic includes addition, subtraction, multiplication, and division. The four different operations of arithmetic are easy to recognize because of the use of signs to indicate the type of operation being performed.

- + (plus) sign represent addition
- (minus) sign represent subtraction
- x Sign represent multiplication
- ÷ Sign represent division (Anderson, Briner, Irons, Shield, Sparrow, & Steinle (2007).

Addition, subtraction, multiplication and division are the keys to the learning of subsequent topics in mathematics and are the foundation of understanding mathematics as a subject. A good performance in mathematics is one of the basic requirements for further studies in many countries. For instance, in Ghana, pupils with or without deafness must obtain a good grade in mathematics to enter Senior High School (SHS), and other tertiary institutions.

Consistent evidence from research studies shows that pupils with deafness lag behind hearing peers in the basic mathematical operations (Swanwick, Oddy & Roper, 2013). A research by the Ghana Education Service (2009), and Sekyere (2008) revealed that the achievement of pupils with deafness in the basic mathematics was unsatisfactory. Their findings were based on the performance of the pupils with deafness in mathematics in the Basic Education Certificate Examinations (BECE) result between the years 2000 and 2004. Similar findings by Pagliaro, Foisack and Kelly (2010), showed same results.

At the basic level, all pupils are expected to develop competency in addition, subtraction, multiplication and division. However, the performance of pupils who are deaf in the basic mathematical operations at University Practice South Inclusive School in Winneba, Ghana shows a vast gap in achievement compared with their hearing counterparts.

At University Practice South Inclusive School, the categories of children with special educational needs include children with hearing impairment and those without hearing impairment. Most of the teachers are general education teachers and do not have proficiency in teaching all these categories of children especially those with deafness. The school is the only place in Effutu Municipality where pupils with deafness are educated together with their hearing peers using total communication as their mode of communication. Through pupils work sample analysis, I observed that in mathematics, pupils at University Practice South Inclusive School had problems with the basic mathematical operations which are addition, subtraction, multiplication and division due to inadequate instructional materials.

An interaction with some of the pupils on their parents' support and involvement in their education revealed that some parents who have pupils who are deaf seem not to understand that, provision of their ward's educational needs would help to improve on their academic performances. Some therefore, neglect their duties of providing the needs of their children with deafness and seem not to benefit from their education. Based on the researcher's interaction with some pupils with deafness on the 23rd March, 2017, it was clear that a Non-Governmental Organization (NGO) named Challenging Heights support some of the pupils who are with deafness in the locality financially to ease the burden of parents but it seems, some of these parents instead of spending the monies received from the NGO in supporting their children with deafness, tend to spend the monies on their other hearing children. These pupils who are deaf had no option than to struggle to cater for their educational needs. According to the pupils, during the researchers' interaction with them, some due to hardship had drop out of school and are now fishermen and some of the girls

pregnant and others selling fish and doing petty trading among others especially at the seashore.

It was unclear whether the current performance of pupils who are deaf in the basic mathematical operations at University Practice Inclusive School was due to school, home or individual, teacher or school factors among others. The teacher who is at the center of the teaching and learning process is expected to teach using different approaches that would satisfy the learning needs of all children in the classroom. This would enable teachers determine the performance of pupils who are deaf in the basic mathematical operations at University Practice South Inclusive School.

To improve on the performance of pupils who are deaf in mathematics, it is very important for teachers to use appropriate teaching methods. There have however been several interventions by Ghana Education Service to enhance effective teaching and learning of topics in mathematics for pupils with deafness. For example, there has been formal teacher training, teacher workshops and seminars to expose teachers to practical knowledge of the teaching and learning of mathematics for pupils with deafness. With these interventions in place, it is assumed that the teaching and learning of mathematics would be effective.

Kenya Institute of Education (2006), conducted a research and found out that teachers who teach pupils who are deaf need to use individual attention, group attention and motivation when teaching. They recommended two approaches in teaching mathematics namely heuristic and didactic approaches. The heuristic method involves the use of active participation and involvement of learners such as question and answer method, demonstrations method, investigations method, group work and discussions. The didactic method involves the teacher taking the sole responsibility of

the teaching and learning process. The learner's role is to receive information from the teacher. The lecture method is an example of this approach. The heuristic approach is the most effective method of teaching mathematics to pupils with deafness. Beside the Kenya Institute of Education, National Council of Teachers of Mathematics of America (2000) also recommended the heuristic method as the most appropriate in teaching mathematics. Gadagbui (2013), however, posited the use of multi- sensory approach as appropriate for teaching pupils with hearing impairment. The use of varied instructional methods and materials (teacher-made and tailor-made ready) during mathematics lessons would help improve performance of pupils with deafness in the basic mathematical operations.

Swanwick and Oddy (2005), also stated that the reason for the low achievement of pupils who are deaf in mathematics compared with their hearing counterparts was due to the nature of their deafness. It should be noted that deafness is only a sensory deficiency which causes damages to the auditory nerves, the cochlea and associated structures (Lyson, 1996). This affects only the transmission of sound (Turnbull, Turnbull, Shank & Leal, 1995) and not their intelligence. This implies that the arithmetic abilities of pupils with deafness possibly play a role in their understanding and performance in mathematics. Research indicates that the achievement gap between pupils with deafness and their hearing counterparts differs as they grow older (Ghana Education Service, 2009,Poku, 2010). Performance of pupils who are deaf in their homework and project work were however satisfactory but when it comes to their class exercises, class tests and their end of term examinations, their achievement is totally different.

Previous research studies on academic achievement of pupils who are deaf at the primary school are few. However, Oppong (2012), also conducted a study on the

achievement of hearing-impaired pupils at Ashanti School for the Deaf in mathematics and English and found the performance of hearing impaired pupils in mathematics and English Language at Ashanti School for the Deaf in those subjects as satisfactory. Other research studies were centered mostly on pupils at the Junior High School for example (Awudi, 2010; Ghana Education Service, 2009; Powers, 2003; Traxler, 2000). All these studies found the performance of the pupils with deafness in mathematics to be below average.

For the purpose of this study, "deaf" is meant to include both deaf and the hard of hearing pupils and used in this study to refer to a group of people who are unable to understand spoken language or lip-reading, their medium of communicating is sign language and they do not benefit from hearing aids. Normal hearing is between 0-25 dBHL however, hearing problems begin from 26dBHL to 90dBHL and above and pupils who are with deafness are within this range Gadagbui (2013).

1.1 Statement of the Problem

Mathematics is seen as a critical component of the educational curriculum and it prepares children for future educational success (Edwards, Edwards & Langdon, 2013; Utah State Office of Education, 2013). Performance of pupils in it is the key to their success in life. However, the performance of pupils who are deaf in Ghanaian schools for the past decade had been unsatisfactory. Pupils with deafness continue to decline in basic mathematical operations compared with their hearing counterparts (GES, 2009). At the basic school, there is a strong focus on the development of numeracy skills. Yet, basic mathematical operations have been a challenge for many pupils with deafness including pupils at University Practice South Inclusive School. An observation by the researcher showed that pupils with deafness do not perform

well in the basic mathematical operations despite the efforts made by Ministry of Education and successive governments in ensuring that all children irrespective of their disability perform well in schools. Studies over the years indicated that pupils who are deaf and who were presented for Basic Education Certificate Examination made lower grades (GES, 2009; Awudi, 2010) and University Practice South Inclusive School was no exception.

An observation made by the researcher during her visit to the school (University Practice Inclusive School) during her first degree programme also confirmed that, pupils who are deaf's performance in class tests, projects, and end of term examinations were very weak. Most of these pupils who are deaf do not get a better grade to continue their education to the Senior High School level. This problem has thus been a source of major concern by many stakeholders including teachers, parents, researchers and policy makers (GES, 2009).

It seems pupils who are deaf at the University Practice South Inclusive School in Winneba have difficulties in learning the basic mathematical operations which are addition, subtraction, multiplication and division. Also, it appears most of the teachers are general education teachers and lack the competency in using sign language in teaching pupils who are with deafness. Again, it seems there are some home, schools and individual factors that affect performance of pupils who are with deafness in the basic mathematical operations. This prompted the researcher to conduct a study to explore the performance of pupils with deafness at University Practice South Inclusive School in Winneba.

1.2 Purpose of the study

The purpose of the study was to explore the performance of upper primary pupils who are deaf in basic mathematical operations at the University Practice South Inclusive School in Winneba in the Central Region of Ghana.

1.3 Objectives of the study

The study sought to achieve the following objectives:

1. Explore the nature of the performance of pupils who are deaf in basic mathematical operations at the University Practice South Inclusive School in Winneba.
2. Identify the factors that influence the performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba.
3. Examine the teaching methods teachers use in teaching basic mathematical operations at the University Practice South Inclusive School in Winneba.
4. Identify strategies put in place to improve teaching and learning of the basic mathematical operations at the University Practice South Inclusive School in Winneba.

1.4 Research Questions

The following research questions were raised to guide the study:

1. What is the nature of performance of pupils who are deaf in the basic mathematical operations?
2. What are the factors that influence the performance of pupils who are deafin the basic mathematical operations at the University Practice South Inclusive School in Winneba?

3. What teaching methods do teachers use in teaching basic mathematical operations at the University Practice South Inclusive School in Winneba?
4. What strategies are put in place to improve on the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba?

1.5 Significance of the study

The results of the study would help to provide empirical information on the nature of performance in the basic mathematical operations among pupils who are deaf at University Practice South Inclusive School. The result would also help to determine the factors that influence the performance of the pupils with deafness in the basic mathematical operations. The results of the study would also help to identify what teaching methods teachers use in teaching the basic mathematical operations and the strategies that can be effective in improving the teaching and learning of the basic mathematical operations.

This would provide vital information for teachers of pupils who are deaf on the kind of methods to use in teaching mathematics at University Practice South Inclusive School. It would also help teachers and school administrators on the need to adopt possible remedies in improving the understanding of mathematics among pupils with deafness in inclusive educational setting. This would also help other pupils with deafness in upper primary to put in much effort in studying the basic operations in mathematics.

Findings of the study would also serve as a source of reference for other researchers who may want to conduct similar studies in different locations. The

finding would therefore serve as empirical facts on which further knowledge can be established in the field of educating pupils with deafness.

Finally, it would provide information for policy makers (Ministry of Education, Ghana Education Service among others) and agencies concerned with providing special needs education to plan and adopt relevant strategies in enhancing the teaching and learning of the basic operations in mathematics to pupils with deafness.

1.6 Delimitation of the Study

Theoretically, the study was delimited to the nature of the performance of pupils with deafness, factors influencing their performance, teaching methods adopted in learning basic mathematical operations and strategies to improve the teaching and learning of the basic mathematical operations.

This study was delimited to only pupils with deafness at the upper primary. The study focused on the performance of pupils who are with deafness at the upper primary which comprises basic four (4) to basic six (6). This was because basic four and five are the upper primary classes with pupils with deafness in the same class with pupils without deafness. Currently basic six has no pupil with deafness thus, they are all hearing pupils. Also, all the pupils with deafness involved in this study started school from kindergarten at University Practice South Inclusive School and had taken lessons in sign language for the past six years.

1.7 Limitations of the study

There were difficulties getting all the pupils who were deaf to be interviewed because they were mostly not in school. The researcher overcame this challenge by visiting the pupils in their homes on Saturdays encouraging them to come to school. Parents of the pupils with deafness were not interviewed as to how they communicate

and assist their wards with deafness because the researcher found it difficult getting them. This delayed the data collection period. Despite these limitations, the outcome of the study was not significantly affected.

1.8 Definition of terms

Inclusive school: Inclusive school is a school which educates all children with disabilities such as cerebral palsy, low vision, epileptic, physical disabled, emotional and behavioural disorders, hard of hearing, deaf and those without disability in the same classroom. It does not segregate children who have different abilities or needs.

Explore: This is the process of critically examining something in order to get more information.

Mathematics: This is a study that is aimed at helping individuals develop ability to solve a wide variety of complex problems and to solve real life situations with the knowledge gain in the subject.

Dyscalculia: Having difficulties in doing mathematics.

Numbers: Numbers expresses an idea of quantity.

Numerals: Numerals represents numbers.

Academic performance: Academic performance is the ability to study and remember facts and being able to communicate such knowledge verbally or in a written form. It may also refer to how students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers leading to success.

Basic mathematical operations: These are addition, subtraction, multiplication and division.

Performance in basic mathematical operations: This refers to pupils' level of proficiency in addition, subtraction, multiplication and division.

Deafness: The condition of being deaf.

Deaf: They are pupils finding difficulty in hearing sounds or using their ears to hear speech and sound well and use Sign Language to communicate. They do not benefit from using hearing aids.

Hearing counterparts: This term refers to pupils who can perceive sound and receives information through their auditory canal.

Total communication: This refers to using speech and sign language as a medium of communication in an inclusive school where there are pupils with deafness and those without deafness.

1.9 Organisation of the Study

The study was presented in six chapters. Chapter one introduced the study with the background to the study, statement of the problem, aim and objectives of the study, research questions, significance of the study, delimitations of the study, limitations of the study, definition of terms and the organization of the study.

Chapter two focused on the literature review considering the research objectives and the theoretical framework of the study. Chapter three dealt with the methodology including research approach, research design, population, instruments used in data collection and analysis, description and distribution of instruments.

Chapter four covered the presentation and analysis of data collected and Chapter five focused on interpretation and discussion of results. Finally, chapter six dealt with the summary, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter present the literature reviewed for the study. The literature review first covered the theoretical framework followed by the review on the key themes raised in the research questions.

- Theoretical Framework (Badura's Social-Cognitive Theory)
- Nature of performance of pupils who are deaf in the basic mathematical operations.
- Factors that influence the performance of pupils who are deaf in the basic mathematical operations.
- Teaching methods teachers use in teaching the basic mathematical operations.
- Strategies that can be put in place to improve the teaching and learning of the basic mathematical operations.
- Summary of literature review

2.1 Theoretical Framework

The theoretical framework of the study was underpinned by the Social-Cognitive Theory (1986) of Albert Badura. This theory focuses on the immediate environment of the child and how it influences his/her cognition.

2.1.1 Social-Cognitive Theory

The social-cognitive theory as the name suggests is a combination of the social and cognitive theories (Badura, 1986; Myers, 2001). The social refers to the immediate environment and the cognitive deals with the mind. The social environment includes the school and the home environment. The school environment

involves all the things that make teaching and learning effective in the school. This include appropriate school environment, location, teaching materials, teachers, pupils. The home environment includes the immediate surroundings, people, location/area, and parents. The cognitive deals with the mind-set of the pupil. Developing positive attitude towards a subject will be determined through performance in that subject.

The social cognitive theory is in relation with the causal model of triadic reciprocal determinism. The proponent of the triadic reciprocal determinism is that an individual's behaviour, personality and the environment all operate as interacting determinants that influence each other, though one may be greater than the other (Badura, 1986). Human behavior is thus influenced by both personal/internal and environmental factors. The personal factors comprise of cognitive, affective and biological and the environmental factors which are basically three (imposed environment, selected environment and constructed environment) are associated with things around us (Badura, 1986).

Badura's social-cognitive theory (1986) further posits that achievement of pupils in an environment is influenced by both external and internal factors. For this, he viewed his theory as "cognitive" and not "behaviourist" Badura (2006a). Badura's social-cognitive theory also stresses on social and personal factors (interest and abilities), as the keys in understanding a phenomenon and places much emphasis on pupils and their disability, gender, school and their academic achievement (Halgin & Whitbourne, 1997). These factors: disability (deafness), pupil's interest and abilities, gender and school have effect on pupil's academic achievement Badura (1986).

The theory opines that, the pupil (person) and the school and home (environment) has a significant role to play in the academic achievement of every pupil in a school (Badura, 1986 &Myers, 2001). The pupil's abilities and interest

towards teaching and learning can either have a positive or negative effect on his or her academic performance. The school can also have an influence on the performance of the individual depending on its type (Badura, 1986 & Myers, 2001).

Badura, in further explaining the social-cognitive theory wrote:

> *"In the social-cognitive people views are either driven by inner forces nor automatically shaped and enrolled by external stimuli. Rather, human functioning is explained in terms of a model of triadic reciprocality in which behavior, cognition and other personal factors, and environmental events all operate as interacting determinants of each other" (Badura, 1986, p. 18).*

Badura's social-cognitive theory as the theoretical framework for this study is appropriate because pupil's performances in the classroom are influenced by both social and cognitive factors. Research indicates that the disability the pupils is having, type of school, the interest of the child and other factors such as the home and gender either have a positive or negative effect on pupil's academic performance in school (Pagliaro & Kritzer, 2009).

2.1.2 Relevance of the Social Cognitive Theory to the Study

This theory is relevant to my study because it would enable teachers understand that the environment of the child can have both negative and positive impact on the child's learning. This could either help or affect pupils' performance in the classroom.

- The theory would correct pupils' negative thinking habit about mathematics as being a difficult subject and help improve on their performance and prevent home, school, teacher and individual factors that may undermine pupils' performance.

- The theory would help teachers place pupils at the centre of the teaching and learning process. As the theory stipulated, an individual's behaviour, personality and the environment all operate and influence each other even tough one would be greater than the other (Badura, 1986). This would enable teachers handle their pupils well during the teaching and learning process by selecting teaching methods that would enable pupils develop interest in learning mathematics.
- This theory would also enable pupils learn to excel academically through their interactions with their peers and teachers.
- In an inclusive school such as University Practice South Inclusive School, this theory would enable teachers adopt appropriate and effective teaching and learning strategies that would be appropriate for all children who are with deafness and those without deafness.
- It would also enable all teachers in the school to learn to promote equal opportunity to all pupils irrespective of their disabilities or gender.
- Pupils who are with deafness would learn to develop good learning habit by first understanding the purpose of their education and then setting up their own goals and strive towards achieving through hard work.

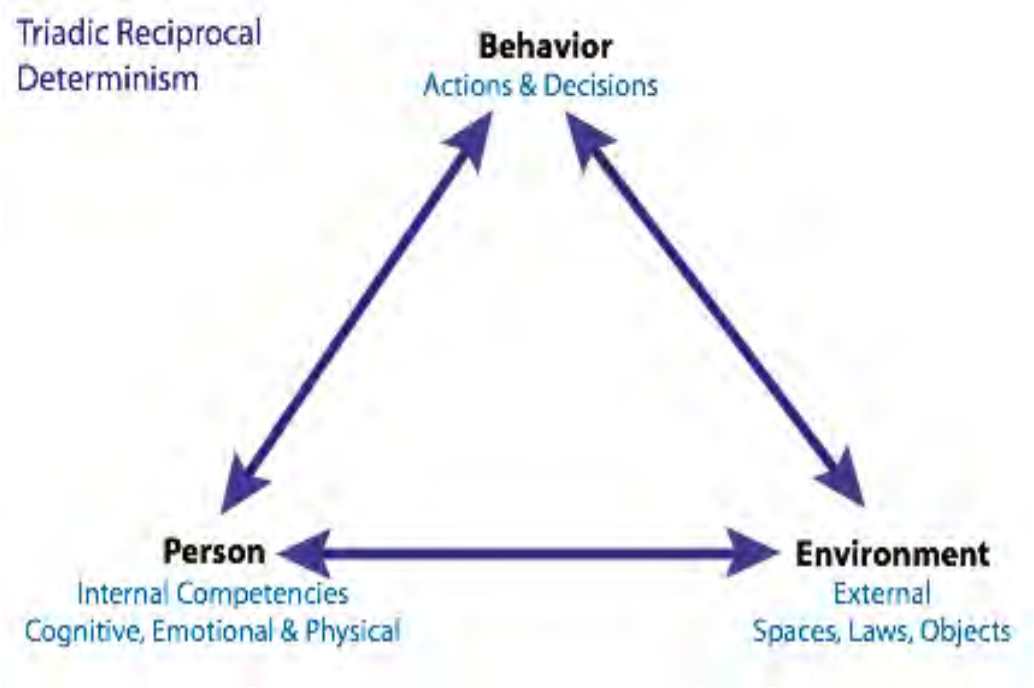

Figure 1: Social Cognitive Theory: Triadic Reciprocal Determinism (Badura, 1986)

The diagram above is the Triadic Reciprocal Determinism of (Badura, 1986) that depicts the Social Cognitive Theory. It stipulates that human behaviour is influenced by both personal and environmental factors.

2.2 Nature of performance of pupils who are deaf in the basic mathematical operations

Mathematics is an integral aspect of an individual's life and is seen in almost every aspect of our life such as cooking, budgeting, shopping, building, buying and selling (Ginsburg, 2002). Mathematics teaching was inappropriate for children including pupils with deafness at an early age by mid-20th century. Theorist in the 20th century such as Thorndike (1922) thought that children critical thinking ability is not ready at that tender age to be introduced mathematics to (Hachey, 2013).

However, Barbosa (2014) opined that children develop mathematical knowledge informally in the home with parents who require them to count, share and

group things. Barbosa (2014) again, reiterated that children learn mathematical concepts before they go to school. They supported this claim by arguing that preschool children can discriminate between different sets of objects on the basis of their numbers and can also reproduce a set of objects with the same numbers. All these daily life activities involve the use of mathematics. People later view mathematics as very important because young children show mathematics knowledge in the home even before school (Claessens & Engel, 2013).

However, the difference between the performance of pupils who are deaf and their hearing pupils in the basic operations in mathematics is varied. The pupils who are deaf lag behind as compared to their hearing counterparts (Traxler, 2000). This necessitated concern raised by stakeholders such as teachers, parents, researchers and policy makers about the low achievement of pupils with deafness in the basic operations in mathematics. Several research indicated that pupils with deafness in the basic operations compared with their hearing peers by 2 to 3.5 years (Swanwick & Oddy, 2005). The argument raised to support the findings was about how pupils who are deaf perform in mathematics particularly in the basic operations compared to their hearing counterparts.

A research done by the Ghana Education Service (2009) and Sekyere (2008) results revealed that the achievement of pupils who are deaf in mathematics was unsatisfactory. Their findings were based on the performance of pupils who are deaf in mathematics in the Basic Education Certificate Examinations (BECE) results between the years 2000 and 2004. Similar studies by Leybaert and Van Cutsem (2002), Mitchell (2008), Pagliaro, Foisack, and Kelly (2010), Swanwick, Oddy, and Roper (2005) showed same result. Traxler (2000), posited that pupils who are deaf over decades and across grade levels, in various countries have scored poorly in

mathematics assessments. The results of their finding made by the above author's present strong evidence that pupil who are deaf have difficulties in mathematics deafness difficulty in mathematics began prior to their formal education.

Hearing children learn incidentally in everyday life for example, from radio, conversations, around dinner table and playing and through that acquire problem solving strategies which prepares them for later mathematics learning. Pupils who are deaf lack access to many of such information due to their hearing loss. Their hearing parents are unable to communicate with them using sign language. Also, in our society, pupils who are deaf are the minority and can scarcely see other pupils who are deaf communicating in sign language for them to learn incidentally from them. The inability of pupils who are deaf benefiting from incidental learning which prepares them for later mathematical learning has resulted in the challenges many of them face in learning the basic operation in mathematics (Claessens & Engel, 2013).

Oppong(2012) conducted a study on "analysis of academic performance of pupils with hearing impairment in Ashanti School for the Deaf". The study employed the causal-comparative intact group post-test-only research design and used the Ghana National Education Assessment instrument for primary six pupils. Two research questions and six hypotheses were raised for the study. The simple random sampling technique was used to select Ashanti Region among the five regions in the northern sector. Findings of the study revealed the performance of hearing-impaired pupils as satisfactory. A gap is filled in this study because the intent of the researcher was on performance of pupils who are with deafness in the basic mathematical operations at University Practice South Inclusive School in Winneba. The stratified and the purposive sampling technique were used in selecting the pupils and their teachers.

The study sampled seven (7) basic four (4) and five (5) pupils who are deaf and five (5) teachers in an inclusive school with other pupils with other disabilities.

Kritzer and Pagliaro (2013) conducted a research on the achievement of deaf and hard of hearing pupils in mathematics and found out that deaf and hard of hearing pupils experience delays in mathematics from preschool. However, according to Kritzer and Pagliaro, they showed improvement in geometry but perform low in problem solving and measurement. This study's focus was on the performance of pupils with deafness in the basic mathematical operations in an inclusive school in Winneba.

Traxler (2000), conducted a study on the achievement of pupils who are deaf in the basic operations in mathematics. The pupils were aged between 9-15 years. It was found out that the performance of pupils who are deaf was below compared with their hearing counterparts on the Stanford Achievements Test. The study concluded that few pupils who are deaf in the USA seem to be at par with their hearing counterparts in the basic operations in mathematics. This study however, attempted to adopt Traxler (2000) study using the same category of pupil's but in an inclusive school with different instrument and procedure for assessing the academic output of pupil's in the basic operations in mathematics.

Nunes (2004), conducted a study and found out that, the performance of pupils who are deaf in mathematics was not encouraging. Nunes stated that, the unsatisfactory performance of the pupils in mathematics started before formal education as their hearing parents are unable to communicate with them in the home in sign language.

Gersten (2012) and Cross (2009) posited the performance of pupils who are deaf in basic operations in mathematics as poor compared with their hearing

counterparts at the same grade level. Their findings revealed that numbers were more critical in hearing children, than deaf children and children's success in mathematics can be used to predict their academic achievement in other subject areas such as science and reading. They argued that the gap that exists between hearing and those with deafness should be identified early in children so that specific areas of weakness can be addressed at an early age prior to having an impact on later learning.

Oyebola (1995) did a comparison study on the achievement and intelligence test scores on primary six deaf boys and girls who were deaf in Nigeria with 182 deaf pupils purposively sampled. The participants were between the ages of ten (10) and twenty(20). Thisauthor used two instruments for the data collection namely teacher developed test in mathematics and researcher developed tests in mathematics. It was found out that for both formative and summative assessment on mathematics, boys performed better than girls. This present study have some relationships.Similar sampling technique were used but with different methods, different sample sizes, different school settings, and different tools to assess their achievement in the basic operations in mathematics.

Amo-Asante (2005) conducted an action research on academic performance of primary two(P2) pupils who were hearing impaired in mathematics at State School for the Deaf in the Greater Accra Region of Ghana, the results revealed that the performance of the pupils to be above average that is 60% and above scores in mathematics after employing intervention to help improve on their achievement in mathematics.

Pagliaro and Kritzer (2010), on the performance of pupils who are deaf in mathematics suggested that parents should include 'learning behaviours' (i.e. mediation behaviours such as focusing attention, asking questions, linking the present

to past and future events, and providing specific praise) in their children to assist them have higher mathematics ability. When pupils with deafness were examined on their informal and formal mathematical knowledge prior to formal schooling at age four to six, the children demonstrated evidence of academic delays (Kritzer, 2009).

An analysis about the performance of pupils who are deaf in mathematics by Leybaert and Van Cutsem, (2002) revealed that most of the studies on the achievement of pupils who are deaf in mathematics were in the numbers, computation and measurement. Within the computation studies identified, most focused on counting, calculation, or number matching and pupils with deafness were behind.

All these studies showed that the performance of pupils who are deaf in the basic operations in mathematics was below compared with their hearing peers. However, most of the studies did not specify the reason for such difficulties. To identify the reasons for the low performance of pupils with deafness in the basic operations it is necessary to identify when the problem began. These are during preschool periods and when enrolled in school (Leybaert & Van Cutsem, 2002).

2.3 Factors that influence the performance of pupils who are deaf in the basic mathematical operations

Pupils who are with deafness experience many learning challenges in many inclusive schools and Schools for the Deaf in Ghana (GES, 2009). This is evident in their formative and summative examinations. They lag as compared to their hearing counterparts in the same class. Their educational needs are not met due to their disability and this prevents them from excelling just like their hearing counterparts. The factors that account for the challenges faced by pupils who are deaf in learning the basic operations in mathematics are discussed below under the following:

- Home factors that influence the performance of pupils who are deaf in the basic operations in mathematics.
- School factors that influence the performance of pupils who are deaf in basic operations in mathematics.
- Teacher factors that influence the performance of pupils who are deaf in basic operations in mathematics.
- Pupil factors that influence the performance of pupils who are deaf in the basic mathematical operations.

2.3.1 Home factors that influence the performance of pupils who are deaf in the basic mathematical operations

2.3.1.1 Inadequate home support

The success of any child depends on the support that the child has from the home Gadagbui (2012). According to Bulletin of Institute of Adult Education 48th Annual New Year School (1996) cited in Gadagbui (2012: p.71), "for every pupil or student who does well and gets through the educational system, there is a parent who was there every step of the way" Therefore, the support from the home is very necessary in ensuring the academic success of pupils who are deaf. The type of home a child comes from determines the success of that child in the school. (Gadagbui, 2012).

Gadagbui, further posited that the atmosphere in the home influence the performance of the child in school. Quarrels between parents, family members and relatives affect the child's performance. This is because quarrels between parents and other family members lead to child neglect and malnutrition. Gadagbui (2012) again, contends that there is no family without disagreement in any form. However, for the

child to excel in the basic operations in mathematics parents, relatives and guardian should maintain a functional home. According to Gadagbui (2012), a functional home is the type of home where parents, siblings and relatives despite their quarrels and arguments remain intact and maintain a mutual trust. For a child with deafness to perform well in the basic operations, at least to some extent the Maslow's Hierarchical Needs Theory must be satisfied.

The Maslow's Hierarchical Needs Theory talks about the provision of five elements which could contribute to the success of pupils in schools. These are the biological and psychological needs which include the provision of basic life needs such as food, air, water, shelter, warmth and sleep. The safety needs include provision of protection, security, order, law and stability. The belongingness and love needs include family affection, relationships and workgroup. The esteem needs include the achievement, status and responsibility and finally the self-actualization involves personal growth and fulfilment (Gadagbui, 2012).

Gadagbui (2003) conducted a study on the impact of the family on the academic performance of children at the Basic and Senior High Schools level including the special needs children. A sample size of eight hundred and forty-four parents (844) and children from all the ten regions were used for the study. Three hundred and seventy-one (371) parents made up of one hundred and ninety-four (194) fathers and one hundred and seventy-seven (177) mothers, three hundred and seventy-three (373) were regular children made up of one hundred and eighteen (118) males and one hundred and eighty-five (185) females were purposively sampled. The results showed a relationship between home and school factors on academic performance of pupils. The instrument used was a questionnaire for both parents and students. Descriptive statistics was used to describe the results.

Therefore, to ensure the success of pupils with deafness in the basic operations in mathematics their parents should support them by providing them their biological and psychological needs which include all the basic things needed in life such as food, drink and shelter. Again, their safety needs such as provision of security and protection should be paramount. More so, their belonging needs such as showing love and affection should be carried to make the deaf pupil's feel they are part of the family and thereby motivate them to learn and even excel better than their shearing counterparts.

2.3.1.2 Low economic status

People with disabilities especially those who are with deafness are more likely to be poor compared with their hearing people. It had been estimated that 20% of the world population living in poverty are people with disabilities (DFID, 2010). According to United Nations Education Scientific and Cultural Organization UNESCO (2010a), one third of the 72 million learners of primary school age who were not in school by 2007 have a disability and that over 90% of learners with disabilities in the world's poorest countries do not go to school. Out of the estimated 150 million learners living with disabilities worldwide, about four in five learners are in developing countries where many live-in poverty.

Ghana is a developing country in which there are poor and the rich people. The level of poverty in rural areas is not the same in the urban areas. Research found out that urban pupils perform better than their counterparts in the rural areas. Poverty has a negative influence on the academic performance of pupils. A child whose parent due to poverty does not provide his or her needs will be behind the one whose parent provides all his/her needs (Kirov, 2002).

2.3.1.3 Parents' educational background

The growth and development of any country or society depends upon the quality of education that it offers to its citizens. It is undoubtedly believed that the basis for any true development must commence with the development of human resources. However, it had been reported that parent's educational background had greater influence on their wards' achievement (Castejon & Perez, 1998) Children whose parents are literate perform better academically than those whose parents are illiterate. This was because these days' parents are required to assist their children with their assignments, projects that are done in the home. A literate parent would be able to explain his or her child's homework. The illiterate parent on the other hand, would not be able to explain things to the ward.

2.3.1.4 Marital status of parents

The marital status of parents being either single, married, divorced, or widow has influence on the academic performance of pupils. When divorce or separation occurs in marriage the child is mostly the affected one. The anxieties from the divorce or separation would extend to his or her academic performance. He or she would not focus and concentrate during the teaching and learning process (Adell, 2009).

In the researchers' clan as an Akan, it is seen as inappropriate for a child to ask the parent why there was a divorce or separation. The child who would ask the parent such question was being disrespectful. The anxiety associated with this emotional problem which is a long-term distress would result in low achievement. However, if the child was told the problem causing for example divorce or separation, it would minimize the distress children go through which in effect affect academic achievement.

2.4 School factors that influence the performance of pupils who are deaf in Basic Operations

The school's role in the teaching and learning process is very important. The school factors that influence the performance of pupils with deafness in the basic operations in mathematics are discussed below:

2.4.1 School location and facilities

Ralenala's study (2005) as cited in (Mokgaetsi, 2009) revealed that thousands of schools still have poor physical infrastructure and many are dilapidated, dangerous, and unfit for human habitation. There is often no water on some school site and poor sanitation thus such conditions do not only affect the teaching and learning activities of the school but also threaten the health of learners and educators as well.

There is a strong correlation between learner performance and the quality of the facilities available to learners (Mokgaetsi, 2009). Several schools do not have laboratories and the situation encourages rote learning by Ralenala (as cited in Mokgaetsi, 2009). Some of the factors contributing towards the poor performance of learners are lack of resources and poor facilities in most schools, especially in rural areas. Some of the schools are dilapidated compared to those in urban areas. Successive government of Ghana all made a pledge to eradicate all schools under trees. Currently, the situation has not changed that much, since most schools especially those in the rural areas lack good infrastructure.

2.4.2 Large class size

Class sizes have also been identified as another determinant and a motivating factor for a better academic performance. A teacher (whether professional or not) who must work with too large a class size would undoubtedly have his performance

hindered and this would have a negative effect on his or her pupils. Too large class sizes might be one of the unfavourable conditions that might affect the performance of teachers in most Ghanaian schools. With the inception of the Ghana School Feeding Programme in selected schools, for instance, Winneba Methodist Primary A, B, C, D. enrolment has increased. This increase in class size brings the problems of ineffective class management, poor supervision of assignment and ineffective teaching and good pupil teacher relationship.

2.5. Teacher factors that influence the performance of pupils who are deaf in the basic mathematical operations

The teacher's role in the teaching and learning process is very important. The teacher factors that influence the performance of pupils with deafness in the basic operations in mathematics are discussed below:

2.5.1 Inadequate instructional aids

Pupils who are deaf are by nature visual learners and they learn and understand lessons best when adequate teaching and learning materials are used in teaching them. Studies have shown that using pictures, charts and other multimedia methods of teaching mathematics to pupils who are deaf enhances understanding as compared to others that do not involve pictures and charts (National Research Council of Kenya, 2012). It also aids teaching and learning because pupils can see and often feel what the teacher teaches. The use of adequate teaching and learning materials in the classrooms help stimulate ideas, demand an active response from the learners and provide enjoyment.

There are several instructional aids teachers can use when teaching pupils with deafness. Pictures, flash cards, charts, counters and equipment, including overhead

projectors, bulletin boards, computers and televisions showing captions on the screen, could also be used in teaching mathematics to pupils with deafness. Unfortunately, most of these devices are not available at University Practice South Inclusive School. This means that they may fail to understand simple basic operation such as subtraction and addition and in effect their achievement, confidence and self-esteem may suffer as a result.

2.5.2 The use of sign language

Sign language is the tool pupils who are deaf use to communicate among themselves (Siegel, 2008). In an inclusive school such as University Practice South, pupils who are deaf study in the same class with their peers without deafness. Sign language is used by some of the teachers during instruction and the pupils also use it during communication with their friends with or without deafness. The pupils who are deaf in University Practice South Inclusive were noted to have low performance in the basic operations and other subjects studied due to the use of sign language.

One of the reasons why pupils who are deaf perform less than their hearing counterparts is the fact that they are educated using the Ghanaian sign language and most of their teachers cannot communicate well with them in sign language. Again, most of the pupils due to truancy are not well versed in the sign language. Teachers who are not well versed in sign language usually employ sign language interpreters. This means that when information is sent from a primary source, it must go through an intermediary, who is the sign language interpreter before the information gets to the pupil with deafness. This increases the chances of the information being distorted. The interpreter to explain the primary information to the pupils with deafness might end up truncating portions of the information or over-elaborating the content of the information. Under examination conditions therefore, pupils with deafness would

often misunderstand questions that are set because of this difficulty. They have trouble in analysing mathematics concept which requires some level of thinking in order to solve a problem. The result is that the pupil with deafness would perform low compared with their hearing counterparts under the same conditions (Antia, & Guardino, 2005).

2. 5. 3 Inappropriate teaching method

Many pupils who are deaf lag in mathematics due to the methods teachers employ in teaching them. In teaching new mathematical concepts to pupils who are deaf, teachers should use methods that build on their previous knowledge and the new concept must be visuals (Pagliaro and Lang, 2007). This would enable the pupils to be part in the teaching and learning process and thus ensure effective learning of the new topic.

Studies have shown that using pictures, charts and other multimedia methods of teaching pupils with deafness enhances understanding as compared to other methods that do not involve pictures and charts (Lang, 2005). A teacher can use total communication which involves using speech and sign language in an inclusive school such as the one under study. Speaking loudly for those who are hard of hearing can help them speech read and form concept.

The methods of teaching mathematics to pupils with deafness can be categorized into two main groups namely heuristic and didactic according to (Kenyan Institute of Education, 2006). The heuristic method involves the use of active participation and involvement of learners. They include question and answer method, demonstrations method, investigations method, probing, group work and discussions. The didactic method involves the teacher being the sole authority as far as knowledge is concerned. The role of the learner is that of passive recipient of knowledge.

Methods involved in this include lecture, deductive and inductive methods (Kenyan Institute of Education, 2006).

The heuristic approach is considered as the most appropriate in teaching mathematics to pupils who are deaf. However, the methods may change depending on the learner's ability and the nature of the topics. The National Council of Teachers of Mathematics of America (NCTM, 2000) recommends this approach as it involves both the learner and the teacher in the teaching and learning process. Teaching mathematics to pupils who are deaf should incorporate the use of varied instructional strategies in teaching.

2.6 Pupil factors

There are several pupil factors that influence the learning of basic operations in mathematics. The paramount of these factors is pupils' attitude towards learning and motivation.

2.6.1 Pupils' attitude towards learning

Attitude is an essential aspect in learning, and it can either hinder or enhance learning. Attitudes are learned throughout life and are embodied within our socialization process. Therefore, a pupil who is highly motivated to learn and sees its importance can make good progress than one who has a very little degree of aspirations, interest and motivation. When one is highly motivated to learn, he/she appreciates its value.

Pupil's attitudes toward learning can be link to the taxonomy of learning styles. (Curry, as cited in Mokgaetsi, 2009) contends that pupil's attitude to learning is based on their understanding of the concepts. These concepts tend to develop two main attitudes on students towards learning; Positive attitudes and negative attitudes towards learning (Mullins, 2006 in Mokgaetsi, 2009). The negative attitude towards

learning could result in pupils performing poorly preventing them from obtaining required results for further studies.

2.6.2 Motivation

Another personal variable most studied is motivation. Motivation is the element that initiates the pupil's own involvement in learning. When a student is strongly motivated, all his effort and attention are directed towards the achievement of a specific goal. In relation to pupils' performance, motivation is influenced by the pupils' own interest, home and school support as well as the child's environment. If pupils are motivated intrinsically to learn a subject, have adequate home, school and environment support, they would excel (Amissah, Oppong Frimpong & Sam- Tagoe, 2009).

2.6.3 Teaching methods teachers use in teaching the basic mathematical operations

2.6.3.1 Heuristic method

The heuristic method involves the use of active participation and involvement of learners. They include question and answer method, demonstrations method, investigations method, probing, group work and discussions. The heuristic approach is considered as the most appropriate in teaching mathematics to pupils who are deaf. However, the methods may change depending on the learners' ability and the nature of the topics. However, in teaching mathematics to pupils with deafness, most teachers do not use the heuristic approach which comprise of discussion, group work, demonstration, question and answers. The National Council of Teachers of Mathematics of America (NCTM, 2000) recommends this approach as appropriate for

teaching mathematics to pupils with deafness because it involves both the learner and the teacher in the teaching and learning process.

2.6.3.2 Repetition method

A simple strategy teacher can use to improve mathematics skills is repetition. By repeating and reviewing previous formulas, lessons and information, pupils are better able to comprehend concepts at a faster rate. According to Wilson (2015), pupils need to be familiar with the basics in mathematics before they are moved to the advanced ones. Repetition is a simple tool that makes it easier for pupils to master the concepts without wasting time. Repetition of lesson would bring the previous lesson back into the spotlight and allow teachers to build on those previous skills to start a new one (Wilson, 2015).

2.6.3.3 Group work

Mathematics is not limited to learning from textbook, lessons, or testing strategy. Pupils have different learning styles and need to have lessons that would help improve all styles of learning to get the best results. Group work is a simple strategy that allows pupils to work with each other and solve problem with ease. Groupings based on mixed ability enable the weaker ones to be assisted by their peers. However, teachers need to be vigilant not to allow the weaker ones to relax as this would not help achieve the objective of the lesson. When a teacher has provided the basic instruction, it's helpful to split the class into pairs or groups to work on problems. This is because group work enables the learners to work as a team, the pupils feel free to discuss their problems among themselves and work together to solve the issues. The goal of group work is to teach pupils critical thinking skills that are necessary for future mathematics problems and real life (Wilson, 2015).

2.6.3.4 The use of mathematics games

Reinforcing the information learned in class is not always the easiest task for teachers, but mathematics games provide the opportunity to make the lesson interesting and encourages pupils to remember the concepts. Depending on the class size, computer availability, and the lesson being taught, games can vary. Teachers can use computer games for the skills or can opt to use class games to make the lesson more fun. Teachers should be sure to incorporate a strategy into games to help students learn the material (Wilson, 2015).

2.6.3.5 Quizzes and test

The use of test and quizzes as a strategy of teaching mathematics to pupils should not be used to scare them but rather be used to identify pupil's strengths and weakness. This would help teachers revise their methods of teaching to the pupils. Pupils with deafness are visual learners and thus communicate using sign language and other visual materials. The use of test and sign quizzes would help them improve their performance in mathematics. For instance, when teachers are moving beyond the simple concepts of numbers into addition, subtraction, multiplication and division, it is important to incorporate tests and quizzes that review the previous lessons taught. This would help teachers assess pupils understanding. When the test shows that students are answering more questions correctly within the time period, teachers are able to determine that pupils have mastered the basic skills and if students are not able to perform to the task, then the teacher can employ another strategy (Wilson, 2015).

2.6.3.6 The use of whiteboard or chalkboard

Pupils' like writing on any surface available to them. Teachers teaching mathematics to pupils with deafness can employ this strategy in teaching mathematics to pupils instead of using the lecture method. With this strategy, after the teacher has

introduced the lesson, a mathematical problem can be given to pupils who would be lined up in front of the white/chalk board in batches. The pupil writes the problem on their part of the board and the teacher can stand back and watch all the class and can address questions immediately. If a pupil is wrong, the teacher can simply stand behind them and watch their thought process and correct immediately instead of waiting to mark their work during break or after school (Wilson, 2015). 9 Strategies that can be put in place to improve the teaching and learning of the basic mathematical operations to pupils with who are deaf.

2.7 Strategies that can be put in place to improve the teaching and learning of the basic operations

2.7.1 The use of adequate and appropriate teaching and learning materials

Teaching and Learning Materials are materials used by teachers to enhance understanding of lessons by pupils. Pupils who are deaf who are visual learners and they understand lesson better when teaching and learning materials are involved. Studies have shown that using pictures, charts and other multimedia methods of teaching mathematics to pupils with deafness enhances understanding as compared to others that do not involve pictures and charts (National Research Council of Kenya, 2012). It also aids teaching and learning because pupils can see and often feel what the teacher teaches. The use of adequate teaching and learning materials in the classrooms help stimulate ideas, demand an active response from the learners and provide enjoyment (National Research Council of Kenya, 2012).

2.8 Conceptual framework

Conceptual framework is a written or visual presentation that "explains either graphically, or in narrative form, the main things to be studied, the key factors, concepts or variables and the presumed relationship among them". It provides the structure/content for the whole study based on literature and personal experience. It

also enables the researcher to move beyond descriptions of 'what' to explanations of 'why' and 'how' (Miles &Huberman, 1994, p. 18).

Several studies have attempted to articulate some variables that influence the academic performance of pupils who are deaf in schools. These variables according to Badura (1986) have been categorized into three which are behavior (actions and decisions), the person (internal competences, cognitive, emotions, physical) and the environment (external spaces, laws, objects)

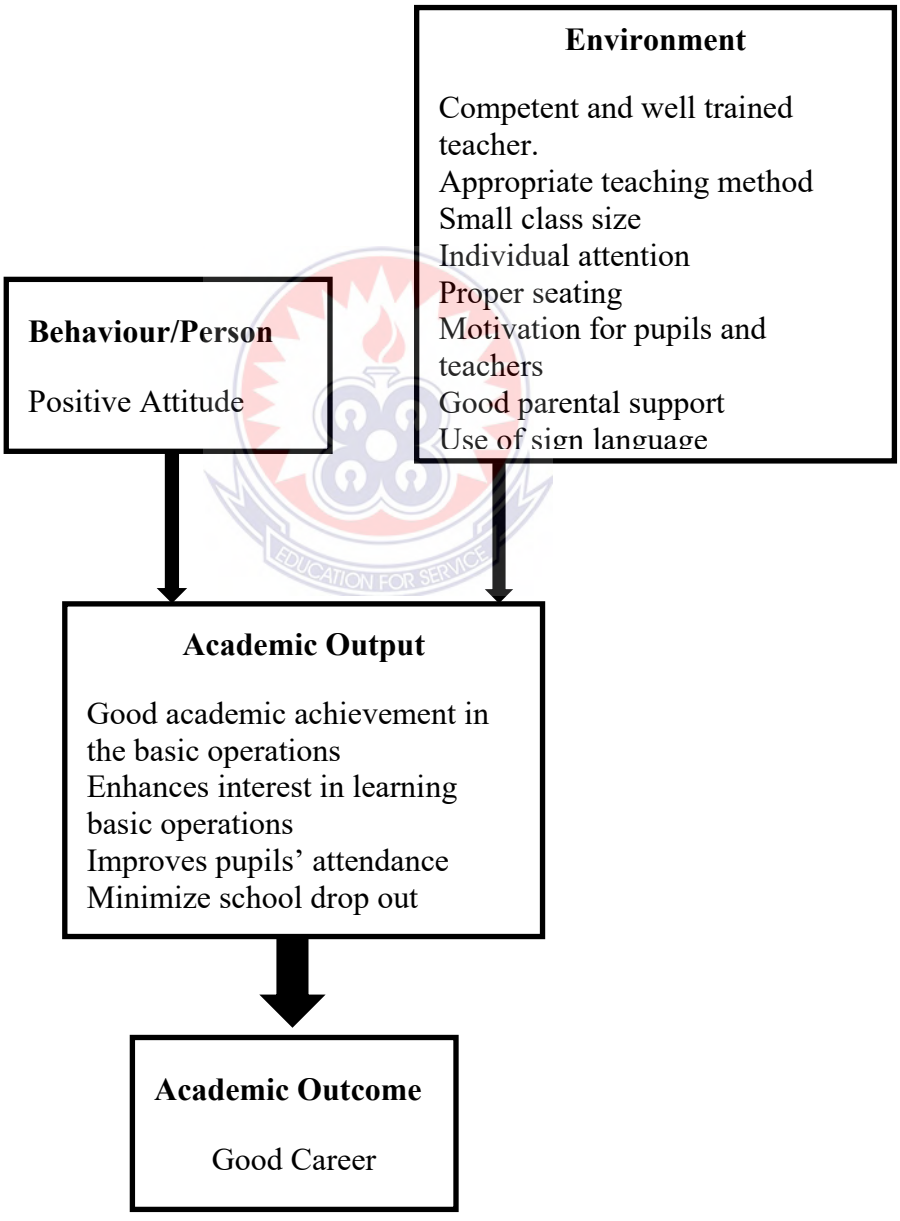

Fig 2: Organogram depicting conceptual framework adapted from Badura (1986) social cognitive theory.

Mathematics which involves everything we do in our lives such as buying, selling, measurement, fashion, technology, economics and this is very important in the lives of every individual(National Research Council of Kenya, 2012). For this reason, teachers who teach them should be well versed with both the content and the use of relevant teaching and learning materials that would aid in their understanding and interest in the basic operations in mathematics lesson. Also, if teachers use the right teaching and learning materials, parents provide the needs of their deaf pupils, if the child him/herself is motivated to learn and develop a good attitude towards the learning of the subject it would result in good outcome. Furthermore, if individual attention is given by teachers during instruction, it would help boost the understanding of pupils. This would only be effective if the class size is small with proper seating arrangement during the teaching and learning.

Therefore, based on the above statement, figure 2 above shows an organogram depicting the conceptual framework for the study. It depicts the triadic factors which are person, behaviour and the environment. Under each is subsection to support the major points raised. It was adapted from Badura's (1986) social cognitive theory particularly the triadic reciprocal determinism. This theory argues that human behaviour is influenced by both personal and environmental factors. In relation to the study, the achievement of pupils in the basic operations in mathematics can be influenced by these factors enumerated by Badura (1986). The behaviour and personal factors have been fused together as one which includes developing positive attitude towards the subject and the interest for the subject.

The environmental factors include competent and well-trained teacher, appropriate teaching method, the use of adequate teaching and learning materials, individual attention, small class size, proper seating position, use of sign language

during instruction, good parental support and motivation of both pupils and teachers. When the behaviour and personal factors and the environmental factors are all working effectively, a good academic output would be assured. This would enable pupils get a good career in future. This would enhance pupil's interest in learning the basic operations in mathematics. It would also improve pupil's attendance in school and reduces school dropout which the study found to be on the increase especially among girls who are deaf in University Practice South Inclusive School.

2.9 Summary of literature review

The study first covered the theoretical framework followed by the review on the key themes raised in the research questions such as: the nature of performance of pupils who are deaf in the basic mathematical operations, factors that influence the performance of pupils who are deaf in the basic mathematical operations, teaching methods teachers use in teaching the basic mathematical operations and the strategies that can be put in place to improve the teaching and learning of basic mathematical operations.

2.10 Research Gap

Research gap is a missing element in a research literature which shows that there is a problem which has not been answered appropriately in a given field of study. It also shows that one is not duplicating an existing research but rather, it shows one has a deep understanding of the area of study. It also makes it possible for a research to be published according to Alvesson and Sandberg (2011).

Traxler (2000) conducted a study on the achievement of pupils with deafness in mathematics. The pupils were aged between 9-15 years. It was found that the performance of pupils with deafness was below compared with their hearing counterparts on the Stanford Achievement Test. The study concluded that few pupils

with deafness in the USA seem to be at par with their hearing counterpart in mathematics. This study filled a gap. Traxler (2000) study used the same category of pupils with deafness. Their ages were between 9-15 years. This study, however, was specifically about pupils with deafness in University Practice South Inclusive School in Winneba within the ages of 9-15 years and in primary school. Traxler study was on deaf pupils in high school. This study was on pupils with deafness in upper primary school within the age range of Traxler's study. Also, different instruments and procedures for assessing the academic output of pupil's in the basic operations in mathematics were used.

Oppong, (2012) conducted a study on "analysis of academic performance of pupils with hearing impairment pupils in Ashanti School for the Deaf". The study employed the causal- comparative intact group post-test-only research design and used the Ghana National Education Assessment instrument for primary six pupils. The study raised two research questions and six hypotheses. The simple random sampling technique was used to select Ashanti Region among the five regions in the northern sector. Findings of the study revealed the performance of the hearing-impaired pupils as satisfactory. This study filled a gap because the study was on performance of upper primary pupils with deafness in the basic mathematical operations at University Practice South Inclusive School in Winneba. The stratified and the purposive sampling technique were used in selecting the pupils and their teachers. The study sampled pupils with deafness in an inclusive school with other pupils with other disabilities. Basic four (4) and five (5) pupils with deafness were sampled for the study.

The present study was conducted on pupils with deafness in an inclusive school in Winneba in the Central Region of Ghana whose parents were mostly

fishermen and fishmongers with little or no education and can hardly speak English Language. There were inadequate sign language interpreters and some of the teachers are not adequately trained in the use of sign language which is the mode of communication for the pupils with deafness. There were inadequate facilities in the school such as infrastructure, furniture and textbooks and inadequate teaching and learning materials.

Amo-Asante (2005) conducted a study on primary twopupils with hearing impairment in mathematics at State School for the Deaf in the Greater Accra Region of Ghana found the performance of the pupils to be above average that is 60% and above scores in mathematics after employing interventions such as remedial teaching, group work to help improve their achievement in mathematics. This study indicated that, my study filled a gap.

An analysis of the performance of deaf pupils in mathematics by Leybaert and Van Cutsem, (2002) concluded that most of the studies on the performance of pupils with deafness in mathematics are in the numbers, computation and measurement. Within the computation studies identified, most focused on counting, calculation, or number matching and pupil with deafness were behind.

The present study observed from the review of literature that all the studies conducted were on the achievement of pupils with deafness in mathematics and not on the basic operations in mathematics (addition, subtraction, multiplication and division). This study further revealed that most of the literature reviewed on the mathematics achievement of pupils with deafness was on deaf and hard of hearing pupil's in Schools for the Deaf. This present study was conducted on pupils with deafness in an inclusive school where there are other pupils with other disabilities.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodology for the study. It covered the research approach, research design, study area, population of the study, sample size, sampling techniques, research instrument, validation of the research instrument, method of data collection, method of data analysis, adequacy and trustworthiness of data, triangulation and ethical considerations.

3.1 Research Approach

This study employed the qualitative approach because the study explored performance of pupils who are deaf in the basic mathematical operations. Parkinson and Drislane (2011) explained qualitative research as a method which involves using methods such as participant observation or case studies which result in a narrative, descriptive account of a setting or practice. Gay, Mills and Airasian (2009) as cited in Hayford (2013: p. 9) further explained qualitative research as a 'collection analysis, and interpretation of comprehensive narrative and visual; that is, non-numerical data to gain insights in a particular phenomenon of interest'.

3.2 Research Design

The study employed the case study research design. Yin (2009) described a case study as an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context. Yin (2009) reiterated that a case study design enables the researcher to select a small geographical area or a very limited number of individuals as the subjects of the study.

The design was appropriate because the study was on one school which was University Practice South Inclusive School in Winneba and it was convenient in collecting data from the pupils with deafness and their teachers. The case study design was chosen because it enabled the study to delve deeper into the performance of pupils with deafness in the basic operations in mathematics at University Practice South Inclusive School in Winneba. The case study design helped to determine the nature of performance among pupils with deafness in the basic operations in mathematics.

The case study design provided the platform for the study to investigate the teaching methods teachers in the inclusive educational setting use in teaching the basic operations in mathematics pupils with and without deafness. The case study design enabled the researcher to investigate into the factors that influence the performance of pupils with deafness in the basic operations in mathematics. Again, the case study design enabled the study to identify the strategies that teachers in an inclusive educational setting used in the teaching and learning the basic operations in mathematics.

3.3 Population of the study

Population is a group of individuals or a group of organisations having common defining characteristics that a researcher can identify and study (Creswell, 2012). Sampson (2012), also explained population as a group of individuals to which the findings, discussion of the findings, and the implications of the research is generalized. The population for the study comprised all pupils and teachers at University Practice South Inclusive Primary School. The population of the study was one hundred and thirty-five (135) people comprising one hundred and one (101) pupils without deafness, twenty-four (24) pupils who are deaf and ten (10) teachers.

Table 1 below indicated the:

Table 3.1 shows the targeted population for this study

Types of Participants	Number
Teachers	10
Pupils with deafness	24
Hearing pupils with other disabilities	101
Total	**135**

Source: **Field data, 2017**

3.4 Sample Size

Sample refers to a group of individuals or elements, or a single individual from whom data is obtained (Hayford, 2013). Robson (2002) cited in Hayford (2013) explained that "a sample is a selection from the population". The sample size for the study was twelve (12) respondents comprising four (4) basic four pupils with deafness, three (3) basic five pupils with deafness and five (5) teachers. Basic four pupils with deafness were made up of two (2) boys and two (2) girls aged between ten (10) and fourteen (14). Basic five pupils with deafness were three (3) made up of two (2) boys and a girl aged between twelve (12) and fifteen (15). The teachers to be sample for this study were five (5) teachers who were all females aged between thirty (30) and forty-five (45). p.260

The sample size was in line with what Johnson and Christensen (2012) defined as a set of elements taken from a larger population. Only teachers who have worked in the school for three (3) three years since posting to the school consider eligible for the study. All the pupils with deafness who were participants of this study had their kindergarten education and had taken lessons using sign language for the past six years at University Practice South Inclusive School. The teachers involved in this

study were all special education teachers who understood and could communicate and teach the pupils using sign language. The hearing level of the pupils who were deaf ranges from severe to profound hearing loss (Audio graph reports).

Table 3.2 shows the sample size for this study.

Class	Male	Female	Age range	Total
Basic four pupils who are deaf	2	2	10-14 years	4
Basic five pupils who are deaf	2	1	10-15 years	3
Special education teachers	-	5	30-45 years	5
Totals	**4**	**3**		**12**

Source: Field data, 2017

3.5 Sampling Techniques

Recognising that the population of teachers and pupils were small, the purposive sampling and the stratified sampling techniques were used to sample the participants for the study (Williams, 2013). The stratified sampling was used to select the pupils who were deaf and the purposive sampling was used to select the teachers.

Hayford (2013) explained stratified sampling as a process of dividing the population into homogeneous subgroups (strata) rather than the entire population. In this study, the strata or the subgroups are pupils with deafness in basic four and basic five. The stratified sampling technique was considered appropriate for the selection of pupils for this study because the participants came from different classes and to ensure that an adequate number of people are included in the study, the stratified sampling is most appropriate.

Fraenkel and Wallen (2009) explained that purposive sampling techniques is a technique in which researchers use their judgment to select a sample that they believe, based on prior information, would provide the data they need. Avoke (2005) further

contended that in purposive sampling technique the researcher handpicks the cases to be included in the sample based on their judgment of typicality.

The purposive sampling technique was used to select the teachers and the pupils with deafness. This was because the study collected data from them and this enabled the gathering of the relevant information about pupils' performance in the basic operations in mathematics. Purposive sampling implies the researcher subjectively determines the type of sample to be used in a study (Creswell 2003). Selecting this technique is very important for this study because the sample were drawn from the same school.

3.6 Instrumentation

The semi-structured interview guide and work sample analysis which comprised their class test scores and end of term's examination records of the pupils who were deaf in mathematics were used. These tools were considered because they were appropriate for the design which offered the researcher the opportunity to gather data about the cases involved in the study (Hancock, 2002).

3.6.1 Semi- structured interview guide

A semi-structured interview guide was used to collect data from pupils who were deaf as well as their teachers. A semi-structured interview guide is a type of interview which follows the standard questions with one or more individually tailored questions to get clarification or probe a person's reasoning (Leedy & Ormrod, 2005). O' Leary (2005) cited in Kusi (2012) also noted that semi structured interviews are neither fully fixed nor fully free and are perhaps best seen as flexible. Interviews generally start with some defined questioning pan but peruse a more conversational style of interview that may see questions answered in an order natural to the flow of the conversation. Semi structured interviews; may also start with a few defined

questions but be ready to peruse any interesting tangents that may develop. Thomas, Walker and Webb (1998) cited in Hayford (2013) noted that semi-structured interviews help participants to bring out their own point of views concerning issues under study. Fetterman (1998) also cited in Hayford (2013), further explained that semi-structured interviews also help researchers to take different dimensions that are not even thought of before the commencement of an interview. The semi-structured interview was used in the study because they allowed for direct interaction with the respondents and the collection of in-depth information tat a questionnaire may not gather.

The interview items were planned such that they were helpful in eliciting responses or answers for the research questions that were set for the study. The interview clarification for the pupils with deafness was presented to them in sign language by the researcher. Their questions involved how pupils with deafness perform in the basic operation, factors that influenced the performance of the pupils with deafness in the basic operations and strategies for improving the teaching and learning of the basic operations in mathematics. This was to ensure consistency of responses from teachers and pupils with deafness for triangulation.

The teachers were interviewed based on their assessment of the learning and performance of pupils with deafness in the basic operations in mathematics focusing on the research questions that were set for the study. The interview for teachers was in two areas. The first area focused on their demographic characteristic which was based on their years of service as special teachers and years they have spent in their current school. The second area was based on the performance of pupils in the basic operations in mathematics, factors that influence their performance of pupils with deafness in learning mathematics and strategies for the teaching and learning of the

operations in mathematics. The interview questions for both the teachers and the pupils with deafness are attached at the appendix B.

3.6.2Work sample analysis

Work sample analysis is a document showing evidence of pupils' academic work (Omari, 2011). The researcher used records of pupils' class tests, end of term examinations results of pupils who are deaf in class four (4) and class five (5). The result were converted into averages for easy analysis of pupil's performance. Only the results for mathematics for pupils who were deaf were considered and analysed. The documents were used to gather information on the nature of performance of upper primary pupils with deafness in the basic operations.

3.7 Validity of the Instrument

In any research work, it is always important to ensure the validity of the instruments used in collecting the data. Macmillan and Schumacher (2001), explained validity as the degree to which the explanations of a phenomena match the realities of the world. The content validity was used. This category content validity looks at whether the instrument used for a study adequately covers all the content that it should with respect to the variable (Korb, 2012).

To ensure that the interview items had the adequate validity, several procedures were adopted. Firstly, content related evidence was used by the researcher for the interview items. This was carefully designed and built on the key variables forming the core themes raised in the research questions. Secondly, the items were given out for peer judgment. The clarity of statements, printing type, appropriateness of language, and clarity of directions were given to peers to look at. Suggestions that were offered in terms of corrections were made. The items were also taken to the

supervisor for further probe for appropriateness. All the corrections and directions that were suggested were executed.

3.8 Pre-test

To determine the reliability of the instrument, a pre-test was conducted on a sample of five (5) pupils with deafness in basic four and five and five (5) teachers at Cape Coast School for the Deaf. This school was chosen because it shared similarity with University Practice South Inclusive School as they are all public school with pupils who are deaf. The rationale for pre-testing was to determine whether the information collected for the study was relevant and trustworthy.

3.9 Trustworthiness of the qualitative data

Speziale and Carpenter (2011,) described trustworthiness as "establishing the validity and reliability of qualitative research". (p. 98). Qualitative research is trustworthy when it accurately represents the experiences of the study participants. Four criteria were used to measure the trustworthiness of data: credibility, dependability, transferability and confirmability. Guba's model for establishing trustworthiness of qualitative research was used because it is well developed conceptually and has been extensively used by qualitative researchers (Speziale and Carpenter (2011)

Credibility is seen when participants see the reported research findings as their own experiences (Speziale & Carpenter, 2011). Enough time was spent with the participants to develop a trusting relationship with them during the interviews and member checks (Holloway, 2005).

Transferability refers to the probability that the study findings have meaning to others in similar situations (Speziale & Carpenter, 2011). In this study, the

researcher ensured the trustworthiness of the findings by exposing the study with colleagues for constructive criticism and finally, the supervisor was responsible for examining the findings, interpretations, and recommendations and attesting that they are supported by the data.

Holloway (2005) indicates that dependability relates to the consistency of findings. In this study, this activity was a means of establishing confirmability of the research. Confirmability is a criterion for measuring the trustworthiness of qualitative research. If a study demonstrates credibility and fittingness, the study is also said to possess confirmability (Speziale & Carpenter, 2011). The study established rigour with the decision trial and proved confirmability through credibility, transferability and dependability.

3.10 Procedure for data collection

Creswell (2012), noted that the site where research takes place and gaining permission before entering a site is very paramount in research. A letter of introduction was taken from the Department of Special Education, University of Education, Winneba (UEW) and was submitted to the head teacher of the University Practice South Inclusive Primary School, as this enabled the researcher to get the necessary assistance and co-operation from the head as well as the teachers. All terms were clearly explained to remove ambiguities and the respondents were given the option to participate voluntarily. The researcher then informed the selected respondents when the researcher would visit the school for the interview.

3.10.1 Interview data

The researcher visited the school while they were in session and conducted the interviews personally. A semi-structured open-ended interview schedule was used for

the respondents in their categories separately. The interview sessions which lasted between 25 to 30 minutes each were conducted at the school at separate times.During the interviews, the researcher kept her language at the level of the interviewees especially for the pupils using sign language. The responses were signed back to them to ensure their approval. With the teachers, their responses were written and shown to them for their prior approval. The perceptions of interviewees and their non-verbal communication were noted for analysis and interpretation.

3.11 Data analysis

The researcher used thematic analysis to establish meaning from the data collected. Morse and Field (1996) explained that thematic analysis involves the search for and identification of common trends that extend throughout an entire interview or set of interviews.

The researcher summarized the interview data collected keeping in mind that more than one theme might exist in a set of interviews. Once identified, the themes that appeared to be significant and concepts linking substantial portions of the interviews were written down and entered on computer (Morse & Field, 1996). Data analysis was done thematically with the aid of Atlas.ti 7.5.18 version, qualitative research data analysis software.

3.12 Ethical considerations

Resnik (2011) defined ethics as rules for distinguishing between right and wrong. There were some basic ethical considerations that were made to protect the rights of respondents. The researcher requested for permission to conduct the study. A written permission was obtained from the Department of Special Education of the University of Education, Winneba indicating the researcher's intention to conduct a

study was sent to the selected school. Written permission (informed consent) was sought from participants for interviewing.

Polit and Hungler (2004) state that confidentiality means that no information that the participant divulges is made public or available to others. The anonymity of a person or an institution is protected by making it impossible to link aspects of data to a specific person or institution. Confidentiality and anonymity were guaranteed by ensuring that data obtained were used in such a way that no one other than the researcher knew the source (Lodico, Spaulding & Voegtle, 2006). In this study no, actual participant names were attached to the information obtained rather, serial numbers were used.

According to De Vos, (2002) privacy refers to agreements between persons that limit the access of others to private information. In this study, the researcher ensured that when participants described their views, the information was not divulged. The participants were informed that they could withdraw from the study at any time if they wished to (Hollow, 2005). This right was explained to them prior to engaging in the study, before the interview.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

4.0 Introduction

This chapter presents the data analysis and discussion of results. The purpose of the study was to explore performance of upper primary pupils who are deaf in basic mathematical operations at the University Practice South Inclusive School in Winneba.

This was a qualitative study. This chapter presents the findings of the data collected from the participants in this study through semi-structured interviews and the analysis of pupils' academic records. It focused on findings of the semi-structured interview and the findings of the document analysis of pupils' records.

The data were analysed to reflect the following themes as raised in the research questions such as:

1. Nature of performance of pupils who are deaf in the basic mathematical operations (addition. subtraction, multiplication and division).
2. Factors that influence the performance of pupils who are deaf in the basic mathematical operations.
3. Teaching methods teachers use in teaching the basic mathematical operations.
4. Strategies that can be put in place to improve the teaching and learning of the basic mathematical operations.

4.1 Results

4.1.1. Research Question 1: What is the nature of performance of pupils who are deaf in the basic mathematical operations?

Performance of pupils in the classroom is paramount to every teacher as this enhances the teaching and learning process. Pupils with deafness are no exception. In

accessing the nature of upper primary pupils with deafness in the basic mathematical operations, the following sub- themes were raised; namely learning mathematics, performance of pupils' in the basic operations (addition, subtraction, multiplication and division) and difference in teaching pupils with deafness and their hearing counterpart.

Learning Mathematics

According to the interview data gathered, majority of the pupils who were deaf who participated in the study were interested in learning mathematics, but others also disliked mathematics. The predominant reason for this mixed feelings were the complex nature of mathematics and the general perceptions that it is a difficult subject. Despite this, the participants were of the views that mathematics is an integral part of education and life, without which, progress in education would be impossible. Participants expressed their anxiety in relation to mathematics and suggested their preferences for other subjects. As a result of this, pupils accept the challenge and incorporate a sense of hope and endurance in tackling mathematics.

Generally, some of the respondent's views were expressed as follows:

> *"Mathematics hard but me learn school. Difficult to understand some but interesting" (A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"Mathematics although is difficult, we learn it at school. It complex but interesting. (Translated)*

Another pupil also commented this way:

> *"Me school learn mathematics every day. Me afraid when it is time for mathematics. I prefer citizenship education to mathematics"(A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"I learn mathematics every day in school. I'm always afraid whenever it time for mathematics. I prefer citizenship education to mathematics" (A translation by the researcher)*

Another pupil have this to say:

> *"Mathematics we learn good but sometimes how teacher teaches me not happy" (A verbatim expression of a pupil in sign language).*

The comments by the pupils revealed that they associated mathematics with some level of relevance and regard it as an important aspect of education and social life. They established the argument that without the basic knowledge in mathematics, buying and selling and other daily activities that require the use of mathematics would be impossible to achieve. The following were made by the pupils:

> *"Mathematics important because everyday things we do mathematics in. When buy, measure and everything we do" (A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"Mathematics is important because it's involve everything we do in our daily lives such as buying, measuring and everything we do (A translation by the researcher).*

Another pupil had this to say:

> *"Mathematics important to life because used in everyday thing we do. Hard but me want to learn because help me get job better future. Difficult but more people done before me" (A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"Mathematics is very important to our daily life and survival. It often used in everything we do. Though it difficult, I want to learn it because it would enable me to secure a good job in the future. Even though it is difficult, other people have been able to do it." (A Translation by the researcher)*

The presentation above suggests that majority of pupils with deafness have some level of interest and anxiety for learning mathematics. They perceive mathematics as an integral part of life and necessary for their survival in daily life and as such, are mandated to learn it though it difficult and complex.

4.1.2. Performance of pupils who are deaf in the basic mathematical operations involving addition and subtraction

Addition is the first basic operation pupils are introduced to in our schools before subtraction, multiplication and then division. The records of the pupils revealed that some of the pupils who have interest in learning mathematics perform well in addition compared with the other operations. However, exercises on addition given as homework and those as class test and end of term examinations are satisfactory compared with the other operations.

Subtraction an aspect of the operations was also seen as a difficult subject by the majority of the pupils' interviewed. They noted that they do not score good marks like they had in additions when it comes to subtraction. They noted that because of their truancy coupled with inadequate support from their parents and guardian and some teachers forgetting to sign they always lag behind their hearing counterparts in subtraction.

These are comments made by some pupils:

> *"Me not always get good marks like friends hearing when teacher teach subtraction. My friends who hears always lead class" (A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"I do not always get good marks just like my hearing counterparts when my teachers teach subtraction. My friends who are without deafness always perform better"*

Another pupil who is deaf remarked this way:

> *"Me sometimes get good marks; teacher writes in me book good but sometimes me not perform good This is because me sometimes not come school. Me shy and not happy when me friends hearing only get marks good"(A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"I sometimes get good scores, and my teacher writes comments like good in my book, but sometimes too I do not do well. This is because sometimes I don't come to school. I feel shy and not happy when only my friends without deafness always get good marks"*

Another pupil who is deaf commented this way:

> "*Mathematics we have every day on timetable. Monday we have to Friday but me like have it two in week. Me not have mathematics exercise books but me teacher sometimes give me book write in. But me like add more than others" (A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"We have mathematics every day on our timetable. From Monday to Friday but wish we have it twice in the week. I do not have mathematics exercise books. My teachers sometimes give me exercises books. I like addition more than the other operations"*

The interview with the teachers also confirmed that the pupils who are deaf lag behind as compared with their hearing counterparts.

One teacher commented this way:

> "*There is a gap between the performance of the pupils with deafness and their hearing counterparts in the same class. The performance of pupils with deafness in subtraction is low compared with their hearing counterparts in the same class. This is because they are always absent in school. Most of them do not have exercises books, pens, erasers and the rest. We sometimes provide them with food, books and pens. They are also not motivated intrinsically to learn mathematics. Some of them think due to their deafness they cannot excel just like their hearing counterparts ((A verbatim expression by a teacher).*

Another teacher expressed this:

> *"The pupils with deafness are visual learners and thus need pictures, charts, illustration to aid understanding during the teaching and learning process. This visual aid which will quicken understanding is not available. Unlike the hearing pupils, the pupils with deafness will not be able to understand without visuals. They therefore fail to perform just like their hearing counterparts in the operation. Also, most of these pupils with deafness do not know the sign language because they are not punctual to school. They therefore do not get the understanding during the teaching and learning process because they do not know most of the signed concepts"(A verbatim expression by a teacher).*

One teacher also remarked this way:

> "*I believe strongly that the separation of the two groups of pupils will tremendously improve the chances of the pupils with deafness excelling just like their hearing counterparts. However, due to the practising of inclusive education in Ghana it is appropriate to reduce the class size so that the teacher can have adequate time to attend to each pupil with deafness and if appropriately offer remedial teaching to help these pupils with special educational needs to compete squarely with their colleagues who hears"(A verbatim expression by a teacher).*

Another teacher had this to say:

> *"To be honest we sometimes forget to sign because the hearing pupils are more than their deaf counterparts. For instance, in a class of forty-seven (47) pupils comprising of twenty-eight (28) girls and nineteen (19) boys the pupils with deafness are four (4). Another class of fifty-five (55) pupils comprising of thirty (30) girls and twenty-five (25) boys has three (3) pupils with deafness. We sometimes forget to sign because is the same teacher who teaches (talk) and sign at the same time. The pupils with deafness due to this fail to grasp all content fast. However, there are some who are equally good" (A verbatim expression by a teacher).*

It seemed clear that mathematics was taught by the teachers in the school to pupils with and without deafness. However, it was noted that most of the pupils with deafness had challenges with subtraction as compared with addition. The teachers

noted that due to the large number of pupils without deafness in the classes, they sometimes forget to sign during instruction and they were also faced with inadequate teaching aids.

4.1.3. Pupil's performance in multiplication and division

Multiplication and division are third and fourth basic operation in mathematics studied in schools. Pupils' records showed that their performances in multiplication and division were low compared with their hearing counterparts in the same operation. Some of the pupils who were deaf on their performance in multiplication and division said:

> *"Me find it hard when me do multiplication and division especially when number is to be taken over"(A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"I encounter some difficulties when am doing multiplication and division especially when it involves carrying over"*

One of the pupils also commented this way.

> *"Me understand addition good but with multiplication and division me not do well. Me not understand why because after teacher teach finish me do well but after some days me forget everything when me take book home me brothers and sisters help me do"(A verbatim expression of a pupil in sign language).*

This was translated by the researcher to:

> *"I understand addition very well but with multiplication and division, I had some challenges. I do not understand why because sometimes after teaching am able to do but after some few days, I forget about everything. Sometimes too when I send it home my siblings help me solve them*"

These claims were further triangulated by the scores of the pupils in the midterm and end of term examinations. Table 4.1 shows the various scores of the pupils with deafness during their midterm and end of term examinations.

Table 4.1: Performance of pupils who are deaf in mathematics in the year 2018

Nº	Class test Scores	End of Term Score	Position in Class
1	40	32	45th
2	50	35	44th
3	61	42	40th
4	53	22	55th
5	62	41	43rd
6	53	50	36th
7	31	43	38th

Source: Field data, 2018

Table 4.1 shows the distribution of marks achieved by the pupils with deafness used in the study. In this distribution, each pupil is represented by a number, this is to conceal for the sake of anonymity and confidentiality. Table 4.1 the first pupil scored 40 in the mid- term examination and scored 32 in the end of term examination and placed 45th in the class. The second pupil scored 50 in the midterm examination and scored 35 in the end of term examination which placed him 44th in the class. The third pupil scored 61 in the midterm examination and scored 42 which placed in 40th in the class. The fourth pupil scored 53 in the midterm examination and scored 22 in the end of term examination which placed him 55th in the class. The fifth pupil scored 62 in the midterm examination and scored 42 in the end of term examination which played him 43rd in the class. The sixth pupil scored 53 in the midterm examination and scored 50 in the final examination which placed him 36th in the class. The seventh pupil scored 31 in the midterm examination but managed to score 43 in the end of term examination, which played him 38th in the class. The general performance of the

pupils is below average with some of the pupils with deafness pupils failing the subject.

It is evident from the above presentation that a majority of the participants perform below average due to their deafness, difficulty nature of mathematics and it complexity. The responses captured from the pupils with deafness and the teachers suggested that if there were adequate provision of their basic needs, adequate teaching and learning material mostly visuals, small class size, motivating the pupils to know they can excel just like their hearing counterparts, adequate special education teachers with knowledge in sign language these pupils with deafness will perform creditably well. Pupils with deafness need to be taught particularly, with visual aids and appropriate teaching methods to help improve their performance in the basic operations.

Differences in performance of pupils who are deaf and their hearing counterparts

The data gathered from the one-on-one interview with the teachers who participated in the study suggested that the pupils who are deaf are underperforming in relation to mathematics. The data revealed that most of the pupils who are deaf were performing below average as compared to the hearing pupils in their class. They teachers complained that most of the pupils who are deaf absent themselves from class and were not willing to learn. They stated that these categories of pupils seem to be less motivated in learning. They noted that, most of the pupils come to school without ample preparation for class activities and work. Some of them have no working exercise books, pens and other relevant leaning materials for studying. The teachers concluded that, some of the pupils with deafness feel that they are limited by their disability and as a result, are not willing to challenge themselves to do beyond

their normal effort. Some of the teachers also blamed the school and government for not doing much for pupils with deafness.

The teachers of the pupils with deafness comments on the differences in the performance of pupils with deafness compared with their hearing counterparts are stated below:

One teacher commented this way:

> "*Teaching both groups of pupils in the same class at the same time is very difficult for both the teacher and pupil. The teacher teaches by talking to the hearing pupils and signing at the same time to the pupil with deafness. This brings discrepancies that are difficult to solve. The pupils with deafness do well when the concept is taught for a long time. But the nature of the regular school would not permit that, we cannot learn one concept for that long since students are preparing to undertake a standard examination at the end. With this in mind, the pupils with deafness are affected. Pupils with deafness students are basically communicated to through sign language and this limits the manner and ability of the teacher to further explain the concept to the pupil"(A verbatim expression by a teacher).*

Another teacher remarked this way:

> "*The performance of pupils with deafness is low compared with their hearing counterparts in the same class. This is because they are always absent in school. They do not have exercises books, pens, erasers and the rest unlike their hearing counterparts who have most of the things their deaf counterparts' lack. We sometimes provide them with food, books and pens. They are not motivated intrinsically to learn mathematics. They think due to their deafness they cannot excel just like their hearing counterparts"(A verbatim expression by a teacher).*

Another teacher commented this way:

> *"Sometimes, the system must be blamed, most of the pupils with deafness are not willing to participate in active class activities because they have been made to believe that they are not going anywhere even if they are academically brilliant. Most of them lack the basic motivation to come to school and are mostly found around our beaches to solicit for fish to sell in order to survive. Those who come to school at times come to school without ample*

> *preparation. They come to school without any academic materials for learning. As such, they perform very low and are amongst the lowest in the class as compared with their hearing colleagues. I believe a lot could be done by the authorities to uplift their faith and motivate them"(A verbatim expression by a teacher).*

Interestingly, the interview data further revealed that some of the participants are from low socio-economic background and lack financial support to fully participate in academic activities in the school. In the view of the respondents, low economic status, lack of motivation, truancy, inadequate support from parents, the use of oral communication (speech and sign language), inadequate teaching aids which are mostly visuals are inadequate in the school. This makes understanding difficult for the pupils with deafness; they therefore perform below compared with their hearing counterparts in the same class.

4.2 Research Question 2: What are the factors that influence performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba?

Performance of pupils in the basic mathematical operations in schools is of much priority to all teachers and the nation at large. This is because mathematics is found in all aspects of our lives as individuals such as cooking, building, buying, selling. Several researches revealed that students have difficulty in learning and passing mathematics. Literature also revealed that students and teacher's attitudes towards teaching and learning are a prevailing factor of this problem.

Regarding the factors that influence performance of pupils with deafness in the basic mathematical operation, the following sub themes were explored, namely availability of adequate teaching and learning materials, mode of communication, parental support, challenges in the teaching and learning of basic mathematical operations to pupil with deafness.

4.2.1 Availability of teaching and learning materials

According to the interview data it was revealed that teachers used chalkboards illustrations and counters during mathematics lessons. The data further suggested that other forms of Teaching and Learning Materials (TLMs) like chalkboard illustrations were also used by teachers to enhance teaching and make abstract concepts more understandable. The participants indicated that these forms of TLMs assist them to fully comprehend the concept been taught and have a better appreciation of mathematics in relation to daily life. The participants also highlighted that the use of TLMs during teaching is not always.

The pupils therefore complained of inadequate teaching and learning materials in the school. A number of pupils with deafness explained that they do not fully understand most of the things taught by their teachers during the teaching and learning process.

One of the pupils who are deaf said this:

> *"Me teachers use chalkboard drawings, counters when teaching mathematics. Teacher sometimes give us papers and we work on give teacher"(A verbatim expression of a pupil in sign language).*

The researcher translated the above to:

> *"My teachers sometimes use chalkboard illustration and counters when teaching mathematics. My teacher sometimes gives us sheet of paper to work on after which it would be taken back by her" (A translation by the researcher)*

Another pupil on the availability of teaching and learning materials in their school remarked:

> *"Me madam sometimes give me and friends materials; sticks, stones, drinks tops to help me and my friends count when learn addition and subtraction me understand better" (A verbatim expression of a pupil in sign language).*

This was translated by the researchers to:

> *"My madam sometimes gave my friends and I materials like sticks, stones and drink tops to help me and my friends count when learning addition and subtraction and I understand better"*

Another pupil who was deaf expressed this:

> *"Teacher not always use teaching and learning materials when teach us in class. If teacher use always me understand lesson well because me see me remember it" (A verbatim expression of a pupil in sign language).*

A translation by the researcher to:

> *"Our teacher sometimes teaches without any teaching and learning materials. If teaching and learning materials are used during lessons, it makes it easier for me to understand the topic because if I see I remember"*

One pupil had this to say:

> *"Me teacher not use teaching and learning materials always when teaching."(A verbatim expression of a pupil in sign language).*

This the researcher translated as:

> *"My teacher does not always use teaching and learning materials when teaching"*

The teachers confirmed what the pupils said by saying that they do not always use the teaching and learning materials in all their lessons.

Two of the teachers expressed their views this way:

> *"The use of teaching and learning materials enhances effective understanding of lessons because pupils especially those with deafness learn and understand things better when seen (A verbatim expression by a teacher.)*

> *"It is good to use teaching and learning materials to teach all pupils but though we improvised some of them, the most durable ones are expensive, and we do not have any fund set aside for these durable materials"(A verbatim expression by a teacher).*

Another teacher commented this way:

> *"I mostly use chalkboard illustrations, charts and realia in aiding the teaching process. Sometimes I refer to experts in sign language to assist me communicate effectively to the pupils. I also use card boards with illustrations to assist the pupils better comprehend what was taught "(A verbatim expression by a teacher)*

One other teacher expressed this:

> *"I use chalkboard illustrations, role play, counters, realia etc. These teaching and learning materials assist in easily explaining the concept to the pupils. Most of the mathematics concepts are abstract and without some real activity or picture to show to the pupils who are deaf it would be difficult to assist them"(A verbatim expression by a teacher).*

Another teacher remarked this way:

> *"I use chalk board illustration, and other teacher learning materials to aid pupils' comprehension of the concepts. It quite helpful since it creates a mental picture of what the teacher is talking about" (A verbatim expression by a teacher).*

The data presented above suggest that teachers use TLMs to complement their teaching and this assist pupil to better comprehend what is taught in class. However, it was revealed that the use of teaching and learning materials were inadequate. Ikonta and Madueke (2005) posited that the use of teaching and learning materials in inclusive schools are inadequate and pupils are to be assisted by using adequate learning materials to help them benefit from the lessons. Teachers should improvise when the actual material is not available because pupils with deafness are visual learners.

4.2.2 Mode of communication

Communication between a teacher and a pupil is very important during the teaching and learning process as it ensures understanding of a lesson. This is because

a barrier to communication hinders effective communication. The interview data revealed that the teachers communicate with the pupils using total communication (speech and sign language). The participants emphasized that, because the teachers are not with deafness themselves, they sometimes forget to sign all what they say and that makes it difficult for them to fully understand the topic taught. The pupils were of the view that the complex nature of mathematics further makes it more difficult to communicate and understand. They agreed that other courses are less confusing as compared with mathematics.

One of the pupils noted this:

> "*Me teachers talk sign the same time because me class have pupils not hear; pupils who hears good. Me teachers sometime forget sign whiles teach me, friends' class. This not helps me understand lesson teacher taught*" *(A verbatim expression of a pupil in sign language).*

The researcher translated the statement above as this:

> *"My teachers talk and sign at the same time because in my class we have pupils with deafness and pupils without deafness in the class. My teachers sometimes forget to sign whiles teaching those of us with deafness and my friends without deafness in class. This does not help me understand the lesson taught" (A translation by the researcher).*

Another pupil said this:

> *Me not do well in the basic operations and sometimes me score low marks because me cannot hear what teacher say so teacher sign to me. At times me teacher sign but stop sign but talk only me not understand".(A verbatim expression of a pupil in sign language).*

This was translated by the researcher as:

> *"I do not perform well in the basic operations and sometimes score low marks because I do not hear what my teacher says so she uses sign language. My teacher sometimes forgets to sign all she says but uses speech and this affect my understanding".*

One pupil posited:

> "*Me madam uses sign language when teach me in class and me understand good but me sometimes not go school so me find difficulties to understand what teacher teaches yesterday" (A verbatim expression of a pupil in sign language).*

The researcher translated it to:

> *"My madam uses sign language during the teaching process in class and I understand her perfectly but sometimes I find it difficult to understand because am mostly not in school and so do not understand what was taught the previous day"*(A translation by the researcher)

One pupil also noted this:

> *"Me not happy when time for mathematics because me sometimes me not understand because teacher not sign all through the lesson" (A verbatim expression of a pupil in sign)*

The researcher translated as this:

> *"I'm not happy when time for mathematics is because I sometimes not understand because my teacher does not use sign language throughout the lesson" (*A translation by the researcher)

The interview with the teachers also confirmed exactly what the pupils said. In the view of one teacher:

> *"The official language of pupils with deafness is the sign language and without a proper understanding of the sign language, effective communication cannot take place even though they may try to show their feelings and emotions, it practically impossible to communicate with them without the sign language. So it is through the sign language that we teach them. I believe that they appreciate it a lot" (Verbatim expression by a teacher).*

Another teacher stated that:

> *"Pupils with deafness are also visual learners and communicate via sign language. This mode of communicating enables pupils with deafness to understand lesson taught. Without which I could not communicate with them" (Verbatim expression by a teacher)*

One teacher also remarked:

> *"Sign language had been tremendously helpful both for the pupils with deafness and us the teachers. Without this indispensable tool, we could not communicate with the pupils with deafness" (Verbatim expression by a teacher)*

The view of one teacher was:

> *"To be honest with you during the teaching and learning process, I forget to sign not intentional but unintentional due to the large number of pupils without deafness. This is because I sign and talk at the same time and again this also slows the pace of lesson delivery" ((Verbatim expression by a teacher)*

The data suggested that pupils have some level of difficulties communicating with their teachers and comprehending what they communicate due to the complex and confusing nature of mathematical operations. It was evident that pupils with deafness do not fully enjoy, benefit and understand most of the lesson taught due to a communication barrier. This would really affect their performance in both their formative and summative examinations. Inclusive education which is now practised in schools in Ghana permit all children with equal opportunity in our schools. The pupils with deafness should not be cut off because in Ghana, pupils with or without a disability are expected to have a pass mark in the entire subject studied in our schools before progressing to the next class. Therefore, any barrier to effective communication should be addressed.

4.2.3 Parental support

Parental support to pupils is significant in their education. Support from the home help shape properly an individual for a better tomorrow. Data gathered from the one-on-one interview showed that many of deaf pupils were faced with parental neglect and were not fully taken care of by parents. They expressed their hurt by

highlighting that their parents refuse to provide them their basic needs as children and pupils. They lack school materials like books, pens and the like. They agreed that their teachers sometimes provide them with the necessary schooling materials like books, pens, pencils rulers, etc. to enable them participate in class activities. The participants indicated that this affects their morale to attend class and makes them absent themselves. They suggested that the reason for their absence is to enable them find some means of survival. The participants agreed that they are mostly assisted by Non-Governmental Agencies for the disabled who come to their aid to assist them in their education. They express their hurt unhappiness by expressing that their parents sometimes spend on their siblings who are able them the disabled and this affects them emotionally and influence their level of motivation and devotion to life and education. It is therefore expedient that the home where the child is coming from provides all that it takes for the child to succeed in life.

One pupil described the support received from the parents as negative and pathetic.

> *"My mother, father not support me education like me brothers, sisters not deaf. Me not have exercise books, pens, notebooks, bag but me sisters and brothers have books, pens, bag. Me teachers good give me exercise books, pens and at times give me food or money me food buy. Me sometimes not go school me go beach get fish sell me get money. Me stop school last year me teacher come to beach see me sell fish to get money buy food. Me teachers told me come to school because teachers will help me. Some group named Challenging Height Winneba here help pupils go school again by helping father, mother with money to support their disabled children. My mother use money buy things give me sisters and brothers and buy funeral clothes for herself me not get anything. Because me with deafness?" ((Verbatim expression by a pupil)*

This was translated by the researcher to:

> *"My parents do not support my education just like they do to my other siblings without deafness. They do not provide me with all my needs. I do not have exercises books, pens, bag and notebooks, bag but my other siblings have books pens and bag. My teachers are very good and have been giving me exercises books, pens and sometimes too either food or money for food. I sometimes absent myself from school to the beach in order to get some fish to sell in order to survive. I drop out from school last year, but my teachers came to the beach looking for me. They saw me selling fish in order to raise some money to buy food. They advised that I return back to school for they will assist me financially. A Non-Governmental Organisation named Challenging Heights in Winneba whose main aim is to send children especially those with disability and in need to school normally provide some financial assistance but my mother will not spend the monies on me but will buy things for my other siblings and also buy many funeral clothes for herself without buying anything for me. Is it because am with deafness?" (A translation by the researcher)*

Another pupil commented negatively about his parents but however reported positively about his stepparents care and support for his education. This was what he said:

> *"My mother was told left me die seeing me with deafness. My mother friend took me as real child to her home. Me not happy about this because me create not myself and me not want to be deaf. Me now parents not have more money but try help me. Me happy but not get everything need. My parents good but me friends who not in my school sometimes laugh and me decide not go school again" (Verbatim expression by a pupil)*

This was translated by the researcher as this:

> *"My mother left me to die after realising that am with deafness. I was adopted by my mother's friend who took me to her home. I was not happy about this because I did not create myself and I did not wish to be this way. My adopted parents do not have enough money however, they assist me.*

Even though am happy with them, I do not get all my needs met. My adopted parents are good but other children who are not in my school always laugh at me because am with deafness and due to that I have decided not to go to school again" (A translation by the researcher)

Another pupil with deafness reported:

"My mother, father think if deaf you not go school and so have no idea about pupils with deafness. Mother, father not give me my need because me brothers and sisters many. Me first girl so if my parents sick now me not go school but take care of them.

This was translated by the researcher as:

"My mother and father have no idea about deafness and so think there is no need to educate a person with deafness. I have many siblings and so my parents do not give me my need. I am the first daughter of my parents and so whenever my parents are sick, I have to abandon school to take care of them"

One pupil reported:

"My parents not dead but not support me. Me sometimes not go to school but sell coconut, fish so that me get more money take care of me need like pens, books" (Verbatim expression of pupil in sign language).

This was translated by the researcher to:

"My parents are not dead; however, they do not support me. I sometimes have to abandon school in order to sell coconut and fish to raise some money to take care of myself" (A translation by the researcher)

The teachers confirmed what the pupils said. One teacher reported:

"Parents support as far as their wards with deafness are concern is minimal. Some of these pupils take care of themselves and do not have exercises books, note books, pens, pencils and others" (Verbatim expression by a teacher)

Another teacher said:

> *"Some of the parents are supportive and willing to invest in their children's education. However, most of these parents have given birth too many children and so do not have the financial status to take care of all of them" ((Verbatim expression by a teacher)*

One teacher remarked:

> *"I have seen a couple of parents who are zealous and willing to do anything in the name of supporting their wards who are with deafness. However, quite a larger number of parents also refuse to emulate that role. They are not willing to invest even the smallest amount in these children. They are more interested in funerals, buying clothes, utensils, sandals than assisting their ward's with deafness" (A verbatim expression by a teacher)*

Data from interviews on the support from parents to their children with deafness revealed that most of the pupils with deafness take care of themselves by selling fish, coconut and other things in other to raise money to cater for themselves.

It was also revealed that some of the parents are willing to support their children but due to having many children they do not have the finances to cater for all the children. Some of the parents prefer using their monies on buying funeral clothes, utensils and sandals than spending on their ward's education especially those with deafness.

4.2.4 Challenges in teaching and learning the basic operations pupil with deafness

One other sub theme was challenges in teaching and learning the basic mathematical operations. Data gathered from pupils revealed that the pupils are intrinsically not motivated to study the basic operations, they are coming to school with many issues bothering them from the home and then inadequate teaching and learning materials from the school.

One pupil with deafness remarked:

> *"Me one big problem is that mathematics hard and different from other subject me learn. Me not pay attention in class because me not understand what me teacher teach" (A verbatim expression by a pupil in sign language)*

This was translated by the researcher as this:

> *"One of my biggest challenges is the fact that mathematics seems to be very different and difficult than any of the subjects we learn. It is difficult to pay attention and participate fully in class when you hardly understand what is been taught"*

Another pupil reported:

> *"Me have many problems so not happy to study in class. Me hungry, not have books, parents not give me money so me how can me learn when me not eaten? My mother, father not give me money so how me learn when no food?" (Verbatim expression by a pupil in sign language)*

This the researcher translated as follows:

> *"I have many problems bothering me and so not happy to study in class. How do I learn when not eaten and hungry, have no books or money from my parents? My parents do not give me money so how can I learn on an empty stomach?*

One pupil said:

> *"My problem is that me not pay attention because me hungry me not understand what teacher teaches especially subtraction. No exercise book to do work and me teachers sometimes not use teaching and learning materials that are beautiful" (Verbatim expression by a pupil in sign language)*

This was translated by the researcher as:

> *"My problem is inability to pay attention in class because of hunger and due to that I do not understand what my teacher teaches especially with subtraction. I have no exercise book and my teachers sometimes use materials that are not attractive"*

The views of the pupils were corroborated by the teachers who stated that teaching pupils with deafness is very tedious because talking and signing at the same time is very difficult. According to the pupils who are deaf, they are faced with numerous problems such as inadequate love, care, provision of their basic school needs, food and so sometimes come to school unprepared for lessons. Some are also not motivated themselves to study as some have already conceive the idea that they cannot do anything because they are with deafness. It should be noted that deafness has nothing to do with their inability to study in school because deafness is only a sensory deficiency which causes damages to the auditory nerves, the cochlea and associated structures. This only inhibits the transmission of sound from the outer ear through to the inner ear and not their intelligence. Teachers should use sign language considering its parameters which includes orientation, location, hand shape and appropriate facial expression. Tailor made or improvised teaching and learning materials which are catchy and relevant to the topic would help improve the performance of pupils with deafness in the basic operations in mathematics when teaching them. However, these materials are inadequate in the school.

One teacher commented:

> *"Talking and signing at the same time is not easy at all. This is because not all words have the exact sign. I try very hard to explain to help the pupils to understand what is been taught. To be honest some of the pupils with deafness do not understand as it can be seen when given exercises to do" (Verbatim expression by a teacher)*

Another teacher reported:

> *"There are inadequate teaching and learning materials in the school, though I sometimes improvise. Pupils with deafness are visual learners and so understand better when things are explained using visuals. Also sign language is such that not all words have it equivalent sign so if the pupils see the images, pictures it would help enhance*

> *effective understanding" (Verbatim expression by a teacher)*

Another teacher said:

> *"The pupils with deafness are mostly not in school. We sometimes organize ourselves to their various homes, the beaches to bring them to school. Some of them upon seeing us ran away. This is very pathetic as some of them told us that they do that to take care of themselves" (Verbatim expression by a teacher).*

Data from interview on challenges in teaching and learning the basic operations to pupil with deafness revealed that there is inadequate teaching and learning material in the school, the pupils intrinsically not motivated to study, truancy and then inadequate support from the home. These challenges influence the participation of pupils and affect their academic performance in mathematics.

4.3 Research Question 3: What teaching methods do teachers use in teaching basic mathematical operations?

The teaching methods used by teachers during the teaching and learning process can have a significant impact on their academic performance of pupils in the classroom. In assessing the teaching methods used by teachers in an inclusive school, the following sub-themes emerged; these are discussion method, question and answer method, group work, demonstration and activity method and pupil's class participation

4.3.1 Discussion method

One of the sub themes that emerged was the discussion method. Discussion method is significant during the teaching and learning process because it enabled pupils to share their views and opinion about a given task. It was noted by some of the respondents their teachers use the discussion method sometimes when they are asked

to explain how they arrived at an answer, but they noted that their teachers sometimes during the teaching and learning do not often give them notes.

These were some views from some pupils.

> *"Me teachers write question on the board. Teacher calls pupils to the board to explain how me get the answer" (Verbatim expression by a pupil in sign language)*

This was translated by the researcher as:

> *"My teachers sometimes write questions on the board and call some of us to the board to explain by discussing how an answer was arrived at*

Another pupil remarked:

> *"Teacher sometimes lead class to discuss a problem or a topic. Me enjoy because a friend will help if you not know" (Verbatim expressions of a pupils in sign language).*

This was translated by the researcher as:

> *"My teacher sometimes leads the class to discuss a problem or a topic. I enjoy discussions because if you don't know, a friend will help you"*

One teacher confirmed what the pupils said and said this:

> *"I mostly use a blend of methods depending on the nature of the topic or concept in order to help the pupils understand the lesson better. Methods like discussion, question and answers, activity method, and demonstration are solely based on the need of the topic and the children. It makes it a little bit easier for them to comprehend what am teaching" (Verbatim expression by a teacher)*

Another teacher remarked:

> *"Sometimes the pupils with deafness find it difficult understanding even when visuals are shown to them. So I encourage peer teachings. Sometimes too some of the pupils with deafness who understand further discusses with their colleagues using sign language to further explain to their friends using discussion method" (Verbatim expression by a teacher)*

4.3.2 Question and answer method

Indeed, question and answer method as a method of teaching pupils' with deafness and those without deafness is very important. This is because it enabled the pupils to be attentive in class because they know their teacher can ask them question at any given time. This method enabled all pupils with or without deafness to pay attention in class during the teaching and learning process. The views of some pupils with deafness are stated below:

> *"Me teacher ask questions to help us remember what we studied past. She helps us with some explanations and discussions to help me friends and me get answer correct. Mathematics hard but madam explain me sometimes understand" (Verbatim expression by a pupil in sign language.*

The researcher translated as:

> *"My teacher uses question and we answer to review what we have already studied. She helps us by explaining further and this help my friends and I get clues and that enables us to get the answer right. Mathematics is very difficult but my madam explains to my understanding"*

Another pupil remarked:

> *"Me teacher used question and answer when teach us. Teacher sometimes ask questions in a group to see which group will be first, sometimes too teacher ask questions individually. Question and answer good because help me always listen teacher well" ((Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"My teacher uses questioning during the teaching and learning process. She sometimes asks questions in a group to see which group emerges. She sometimes asks questions individually as a way of evaluating the pupils. Question and answer method as a method of teaching is good because it helps me to be attentive any time in class"*

The teachers admitted that they use question and answer method during instruction. One teacher admitted:

> *"I use questioning to review previous lesson and to build on the subsequent ones. It becomes very easier for me to know pupils level of understanding if I ask them questions. ((Verbatim expression by a teacher).*

Another teacher remarked:

> *"Questioning help my pupils to be attentive in class and so I mostly used them" (Verbatim expression by a teacher).*

4.3.3 Group work

Group work as a method of teaching basic mathematics to pupils with deafness is very important during the learning process. This method enables pupils with deafness to work with those without deafness and thereby help promoting the inclusiveness we are all seeking in our schools. Group work also foster unity and togetherness in a school. This is because when put into a group, the members in each group learn from each other and participate freely in the discussion. Even though group work has some advantages some of the pupils with deafness interviewed complained of its usage by some of their teachers. Others were also of the view that group work is good and helpful.

The views of some of the pupils were:

> *"Me not like group work because me deaf. Some of my colleagues not deaf not sign during group work discussions" ((Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"I do not like group work because some of my hearing colleagues do not sign during group discussions" (Verbatim expression by a pupil in sign language.*

Another pupil with deafness remarked:

> *"Me not like group work because it makes other pupils to know me not contribute and make me not happy.(Verbatim expression by a pupil in sign language).*

This was translated by the researcher as:

> *"I don't like group work because it exposes me if I don't contribute*

Two of the pupils with deafness said this:

> *"Group work helpful because pupils not see my weakness. I tell my friends in my group how to arrive at an answer to a question through signing to them. Me also learn from them because some friends know how to sign" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"Group work is good and helpful because it does not expose my weakness. I communicate my ideas as to how to arrive at an answer to a question by using sign language. I learn from them because some of my colleagues can communicate with me using sign language"*

Another pupil said this:

> *"Group work good because it helps me learn from my friends especially those without deafness" (Verbatim expression by a pupil in sign language).*

This was translated by the researcher as:

> *"Group work is good because it enables me to learn from my friends especially those without deafness"*

Two teachers confirmed what the pupils said about teachers using group work as a method of teaching.

One of them said:

> *"The pupils with deafness do not want to contribute in class during instructional time that is why I put them into smaller groups to enable them contribute with their peers using sign language. This will also assist those without deafness to improve upon their signing skills" (Verbatim expression by a teacher).*

Another teacher remarked:

> *"Group work encourages peer teaching because pupils learn and understand things better with their peers" (Verbatim expressions by a teacher)*

From the data gathered it was realized that group work promotes pupil's participation in class and it enables pupils to learn from each other especially when put into smaller groups. On the other hand, group work encourages laziness on some part of the pupils especially those with deafness. This is because some of the pupils without deafness cannot communicate in sign language and so those with deafness do not contribute but the hearing pupils does all the contributions. It would therefore be appropriate if pupils with deafness are made group leaders to enable them become active members in a group.

4.3. 4 Demonstration and activity method

Demonstrations method and activity method as a method of teaching pupils with deafness can have a significant impact on the performance of pupils in the basic mathematical operations. Pupils with deafness are visual learners and thus understand lessons better when it is activity oriented and seen by learners. Pupils with deafness and their teachers indicated that the methods are used during the teaching and learning process. The pupil with deafness indicated that their teachers used that method to enhance their understanding when it comes to the concept of the basic mathematical operations.

One pupil with deafness indicated:

> *"Me teacher sometimes teach me and my friends without showing us anything. Me sometimes confuse"((Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"My teachers sometimes teach my friends and I without demonstrating but only explain by talking. I sometimes get confuse" (Verbatim expression by a teacher)*

Another pupil remarked:

> *"Me teacher sometimes use demonstration and activity together. Teachers sometimes show us how to arrive at an answer. She demonstrates on the board and me and my friends know how to arrive at the answer. She does many activities like using abacus, counters and stones" (Verbatim expression by a pupil in sign language).*

This was translated by the researcher as:

> *"My teachers sometimes blend the demonstration method with the activity method. She sometimes shows how to arrive at an answer by demonstrating on the board. She sometimes does many activities using abacus, counters and stones"*

The teachers' comments on the demonstration and activity method confirmed what the pupils said.

One teacher said:

> *"I use demonstration a lot because pupils with deafness are mostly interested in seeing some physical display of the concept been taught. When they capture the demonstration, it becomes very easier to work with them. Sometimes depending on the topic, I also use activity method to enable them understand concept better" (Verbatim expression by a teacher)*

Another teacher remarked:

> *"Depending on the demands of the class and the topic, I may use activity method, and a bit of demonstration. The pupils with deafness love the use of demonstrations and activity method in aiding their understanding. They learn quickly when they see a picture or demonstration of the concept been described" (Verbatim expression by a teacher)*

4.3.5: Pupil's Class Participation

With all these methods, class participation emerged because it an integral part of the teaching and learning process. Pupils' enjoy and understand lessons better when they are involved in the teaching and learning process. The pupils when interviewed revealed that their teachers involved them during the teaching and learning process. The views of two of the pupils were:

> *"Me teacher good always call me with deafness and friend not with deafness to the board to do work when teach us. I like that but me not know if another teacher when me go next class will do that" (Verbatim expression by a pupil in sign language)*

This was translated by the researcher as:

> *"My teacher is good because during the teaching and learning process my teacher involves all pupils during the teaching and learning process. We all participate without discrimination. However, I don't know whether our participation as pupils with deafness will continue if we move to the next class"*

> *"Me teacher call me with deafness and friend hearing the same work to work on board. Friend hearing get answer correct but me get answer wrong and this makes me sad" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher to:

> *"My teacher always involves those of us with deafness and my friends without deafness to the board to do a given work. She gives us equal opportunity however; my friends without deafness mostly get the answer correct but am mostly sad because sometimes I get the answer wrong"*

One pupil remarked:

> *"Me madam always involve us, sometimes she calls me to board but me not get answer correct and so if me not know the answer to a question, me not like to participate. This makes me feel bad"(Verbatim expression by a pupil in sign language.*

This was translated by the researcher as follows:

> *"Our madam involves all of us, sometimes when I don't know the answer, board to solve basic mathematical operations but sometimes get the wrong. That feeling makes me anxious and uncomfortable"*

One pupil remarked:

> *"Me teacher call us to the chalkboard to work to help me understand but me sometimes feel shy if not get answer correct but teacher asked colleagues hearing to help work answer. This helps me not fear when talking to people"(Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"We are all involved in the teaching and learning process. Our madam mostly calls us at random and if you are not lucky, you will be asked to work for the answer with some help from your colleagues. Though it frightening and embarrassing if you are called and you do not know the answer however, it helps to build self-confidence*"

The teachers confirmed what the pupils said about their participation during the teaching and learning process.

One teacher remarked:

> *"For effective teaching and learning, all pupils must be involved during the learning process" (Teacher, E)*

Another teacher said:

> *"I always my students during my teaching because involving them and them participating make understanding easy for my students" (Teacher B)*

The interview data from the teachers confirmed what the pupils said. Participation of pupils during the teaching and learning process is helpful because it enabled the pupils to enjoy the teaching and learning process because they were involved, and this makes them understand the lesson better. It also gives all pupils equal opportunity and thus fulfills the inclusive we are practicing now in our schools.

4.4 Research Question 4: What are the strategies put in place to improve on the teaching and learning of basic mathematical operations?

The strategies teachers employ during the teaching and learning process can have a significant impact on the academic performance of pupils particularly pupils with deafness. For a good academic output pupil with deafness require varying strategies to be employed by teachers before, during and after the learning process. Responses from the teachers and pupils indicated that teachers use varying strategies when teaching basic mathematical operations (addition, subtraction, multiplication and division) to improve their pupils with deafness performance. However, much need to be done in order to ensure equal performance of pupils with deafness and their hearing counterparts. In evaluating the strategies for improving the teaching and learning the basic mathematical operations, the following sub-themes emerged: these are remedial teaching, small class size, reduction of curriculum content for schools, trained teachers in sign language, the use of appropriate teaching and learning materials and parental involvement. The responses from the pupils and their teachers on the strategies employed during the teaching and learning process are reported below:

4.4.1. Remedial teaching

In the classroom the teacher's priority is to promote quality learning among his or her pupils. This the teacher does by ensuring that all pupils participate during the learning process and then find out where pupils have weakness that needs to be improved. Remedial teaching is the best option to address some of these weaknesses. Remedial teaching is a type of teaching offered to pupils identified as having specific learning challenges such as in mathematics and English Language which need to be addressed to avoid recurring (Burris, 2009). It offered the opportunity for learners who are under performing to perform creditably. It also enables pupils especially

those with deafness to understand properly what was previously taught and what was previously not understood. The pupils with deafness said when their teachers give them extra time, it enables them to enjoy lesson which they did not understood earlier on.

Two of the pupils interviewed said:

> *"Me enjoy lesson better if teacher teach slow down and give me more time and over again teach what teach past. Me understand" (Verbatim expression by a pupil in sign language.*

> *"Me like teacher teach finish, give me more homework, teach me again differently what me not understand"(Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"I enjoy lessons better if teacher reduce the pace of her lesson delivery, give me more time and go over what was previously taught. It makes understanding easy for me.*

> *"I like my teacher to give me homework whenever she finishes teaching us and further teach me what I did not understand" (A translation by the researcher)*

Another pupil with deafness said:

> *"Me like teacher have more time, make questions easy for me by explaining more questions hard" (Verbatim expression by a pupil in sign language)*

This was translated by the researcher as:

> *"I want my teachers to have more time for me, explaining difficult questions to me for easy understanding"*

The views of two teachers were that:

> *"I sometimes meet my pupils especially those with deafness if I identify they commits mistakes after exercises are given . I meet them one on one for more clarification but not often because of time"(Verbatim expression by a teacher).*

> *"Remedial teaching becomes very difficult for me to be honest with you. I know it is a way of helping pupils who are weak to overcome their weakness. However, pupils with deafness in an inclusive school use the same curriculum just like their counterparts in other regular school. We are expected to complete the syllabus within a specified period and give a maximum of forty-five (45) exercises within a term. I need to complete the syllabus and give the required number of exercises expected of me. This reduces the number of times I have to meet my pupils for remedial lessons"(Verbatim expression by a teacher)*

The view of one teacher was:

> *"The syllabus content and the number of subjects should be reduced so that we can have ample time for our pupils" (Verbatim expression by a teacher.*

Remedial teaching offers the classroom teacher the opportunity to assist pupils identified as having challenges academically. The teachers during the interview said they tried to do remedial teaching for the pupils with deafness sometimes but wished to do it on daily basis. However, they had been given a syllabus to complete within a specified period and had to give a maximum number of work output in order not to question so they did not have enough time to do remedial teaching mostly for the pupils with deafness. The data gathered also revealed that the pupils as well as their teachers liked remedial teaching. It was confirmed by the pupils that they understood lesson better if the teachers go through again with them. The teachers on their part confirmed that the pupils with deafness learn at a slow pace and so remedial teaching is the best option for them however, due to time factor they are unable to do their best.

4.4.2 Small class size

Class size is a major concern when it comes to effective teaching and learning. Teachers are expected to teach and evaluate lessons effectively whether the class size is small or large. Data gathered from teachers and their pupils revealed that the class

size is too large and this greatly affects the learning process. They therefore wished the class size is reduced to a minimum size. A teacher who has to work with a large a class size would undoubtedly have his performance hindered and this will have a negative effect on his pupils. Large class sizes may be one of conditions that might affect the performance of teachers in most Ghanaian schools. With the introduction of the Ghana School Feeding Programme (GSFP, 2005), school enrolment has increased tremendously in some cases over 80 pupils in a class handled by one teacher. This increase in class size brings in its trail problems of ineffective class management, poor supervision of assignment and ineffective teaching and personal pupil teacher contacts. Therefore, a small class size would be the most appropriate. One of the pupils remarked:

> *"Me class pupils many teachers not have time more for me and friends more. Me happy if class small teacher has time more for me" ((Verbatim expression by a pupil in sign language)*

This was translated by the researcher as:

> *"The number of pupils in my class is more and due to that my teachers do not have enough time for me and my friends. I will be happy if the class size is reduced, and my teachers have more time for me"*

The teachers on the issue of small class size commented that it is the most appropriate for effective teaching and learning.

One of the teachers remarked:

> *"Teaching pupils with deafness and their hearing counterparts are very tedious. The teacher who is supposed to sign and talk during the teaching and learning process has the following to take care of; class control, giving and marking of assignment and homework and other co-curricular activities to take care of. Therefore, if the number of pupils in the class is more, the teaching and learning would be affected. Therefore, the most appropriate is a small class size" (Verbatim expression by a teacher).*

Another teacher on the small class size commented:

> *"Large class size would not enable me to have enough time for my pupils and even offer remedial teaching to those who are weak. I think if the class size is reduced, it would enable me to have more time for my pupils" (Verbatim expression by a pupil in sign language.*

The view of one teacher was:

> *"Pupils with deafness need individual attention and thus understood better when lessons are repeated severally. Small class size is the best for them. However, currently due to the large class size we are unable to meet the individual needs of all the pupils in the class"(Verbatim expression by a teacher)*

The teachers and the pupil's comments on large class revealed that number of the pupil in the class should be reduced from seventy (70) in some cases to at least twenty-five (25). This would at least enable the teacher to at least attend to the individual needs of most of the pupils in the classroom.

4.4.3 Reduction of subjects and its contents in schools

Academic performance of pupils with deafness in mathematics is very important to every teacher because without a pass in this subject pupil cannot progress to the next stage in their academic life. However, due to several subjects taught in schools coupled with other factors, the performance of pupils with deafness in mathematics is low compared with their hearing counterparts. The pupils with deafness learn at a very slow pace and repetition of lesson helps them understand concept better. However, due to the several subjects taught and learnt in schools, teachers have little time repeating lessons for a long time. It would be appropriate if the number of subjects studied and its curriculum content for schools are reduced so that pupils especially those with deafness would be able to excel just like some of their hearing counterparts.

One pupil commented:

> *"Me happy if subject me learn school reduced. Help me do well because me have to learn few in school" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"I would be very happy if the subject learnt in school is reduced. This would help me excel because, I have few things to study in school"*

Another pupil with deafness said this:

> *"Me like the head to reduce subjects me learn school because its more" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"I would like the head of the school to reduce the subjects studied in school because they are many"*

The view of one teacher was:

> *"There should be a reduction in the curriculum content for pupils so that all pupils with special educational needs especially those with deafness would also benefit because the content is too packed" (Verbatim expression by a teacher).*

One teacher reported:

> *"The Curriculum Research Development Division should consider planning a curriculum for pupils with reduce content which would also benefit pupils with special educational needs which would exclude some topics which they are currently learning" (Verbatim expression by a teacher)*

Data collected on the reduction of subjects and its content revealed that both the pupils and teachers wished the subject and its content are reduced so that there would have adequate time to concentrate and repeat lesson for easy understanding. The government should consider reducing the number of subjects and its content for pupils so that those who learn at a slower pace would not be left behind.

4.4.4Training teachers in sign language

Sign language is the medium by which individuals with deafness communicate among themselves. The teacher who is also an interpreter teaches using oral language and signs at the same time to the pupils with deafness in an inclusive school just like the one under study. This means that when information is sent by the teacher, he or she translates it using sign language so that the pupils with deafness would also benefit just as their hearing counterparts. However, in a situation where the teacher cannot communicate to those with deafness, there is an interpreter. In this situation, the information is sent from the source that is the teacher to the interpreter who interprets using sign language before the pupil with deafness gets the message. This increases the chances of the information being distorted. The interpreter in an attempt to explain the primary information to the pupils with deafness might end up truncating portions of the information or over elaborating the content of the information.

Teachers who are not trained in sign language would find it difficult communicating to the pupils with deafness. Such teachers therefore need interpreters to interpret the information to the learners with deafness. In the view of the participants, some of the teachers in the school are not trained in sign language. This makes teaching and learning very difficult especially to the pupils with deafness. One pupil on the training of teachers in sign language said:

> *"Me teachers teach pupils deaf and pupils hearing class same. Me teacher some teach not use sign language because teacher cannot sign so teacher talk only when teach us"(Verbatim expression by a pupil in sign language)*

This was translated by the researcher to:

> *"My teachers teach pupils with deafness and their hearing counterparts in the same class. Some of my teachers teach without using sign language because they cannot sign so they only talk using speech"*

Another pupil with deafness commented:

> *"Me teacher not sign some concepts when teach me and friends in class but sign some. Me think teacher not know sign language well" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"My teacher does not sign some of the concepts during the teaching and learning process in the classroom with my friends. I think my teachers do not know the sign language very well*

One pupil also noted:

> *"Me teachers some use sign language when teach us, me think different friends. All teachers in me school be train well to know all aspect in sign language"(Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> "*My teachers' uses sign language during instruction however; I think all the aspect of sign language should be known in order to help my friends and I. All the teachers need to be trained to know all aspects in sign language"*

One teacher noted:

> *"I teach my pupils using sign language during instruction but to be honest I do not know all concepts in sign language. This is because some of the words in the English Language do not have its equivalent sign so what I normally do is to explain the word for my pupils to understand. I think more teachers should be trained in sign language and also there should be a uniform dictionary in sign language so that teachers especially those who do not know sign language can refer to for better understanding" (Verbatim expression by a teacher)*

Another teacher said:

> *"Sign language had been tremendously helpful for the pupils with deafness, pupils without deafness and their teachers. Without this language we could not communicate with our students. I can communicate very well with my pupils in sign language but some of my colleagues cannot. It would be appropriate if more teachers are trained in sign*

> *language, it would go a long way to help all pupils those with and those without deafness" (Verbatim expression by a teacher.*

The view of one teacher was:

> *"The pupils with deafness uses sign language as their official language and without acquiring knowledge in sign language pupils with deafness cannot benefit from instruction. It is therefore very important for all teachers to have an idea about sign language so that they would be able to communicate with individuals and then pupils with deafness" (Verbatim expression by a pupil in sign language.*

Data collected on the teachers and pupils revealed that some of the teachers use sign language and oral communication for both the pupils with deafness and their hearing counterparts respectively. Others were noted to have no idea about sign language but were willing to learn. Some of the teachers who were already degree holders noted they are ready to apply for certificate in sign language so that they would be able to communicate well with the pupils with deafness. Again, they posited that the sign language class offered to them every Thursday by the head of the school had really helped them to communicate to some extent with their deaf pupils They admitted much need to be done on their part in order to help their pupils understand lessons better during the teaching process.

4.4.5 The use of appropriate teaching and learning materials

Pupils who are with deafness are visual learners and they understand lesson better when there are visuals to support what have been taught. The National Research Council of Kenya (2012) argued that using pictures, charts and other multimedia methods of teaching mathematics to pupils with deafness enhances understanding as compared to others that do not involve pictures and charts.

The data gathered suggested that teachers use chalkboard illustrations, cardboard illustrations charts to aid them in teaching pupils. The teachers highlighted that the use of teaching and learning materials enhances the understanding of concepts. They agreed that mathematics concepts are abstract and without some real activity or picture to show to the pupil with deafness, it would be difficult to assist them. These concrete materials make it easier for pupils to understand the various concepts taught but most of them are not available in the school. Teachers sometimes improvised to make understanding better for the pupils.

One of the teachers shared her experience by stating that:

> *"I mostly use chalkboard illustrations, charts and realia in aiding the teaching process. I also use card boards with illustrations to assist the pupils better comprehend what was taught"(Verbatim expression by a teacher)*

Another teacher also commented by saying that:

> *"I sometimes improvise to help my pupil to understand the lesson because most of the teaching and learning materials are not available in the school"(Verbatim expression by a teacher)*

A third participant also added that:

> *"I use chalk board illustration, and other teacher learning materials to aid pupils' comprehension of the concepts. It quite helpful since it creates a mental picture of what the teacher is talking about" (Verbatim expression by a pupil in sign language.*

The data presented above suggested that teachers use Teaching and Learning Materials to complement their teaching and this assist pupil to better comprehend what is taught in class. The data also revealed the learning materials in the school are inadequate and so the provision of adequate teaching and learning materials would make lesson more interesting and understandable.

4.4.6 Parental involvement

Another tool that facilitates effective teaching and learning is parental involvement. Parents' involvement in the education of the child is of great benefit not to the child alone but to the school and the parents as well. The type of home a child comes from determines the success of that child in the school. It is therefore appropriate for parent to show love, care, and commitment and provide all that the need in school to support the child in ensuring the academic success of him or her (Gadagbui, 2013).

These were the pupils' complaints:

> *"My parents not support me education same as me brothers and sisters hears good. Parents me not give all what me need. Me not have exercise books, pens and notebooks. Me teachers good give me exercise books, pens, money and food sometimes" (Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"My parents do not support my education just like they do to my other siblings without deafness. They do not provide me with all my need. I do not have exercises books, pens and notebooks. My teachers are very good and have been supporting me with exercises books, pens, money and sometimes food"*

Two pupils commenting on their parents' involvement remarked:

> *"My mother left me with my father when me young and me father wife look after me. Me not happy that me deaf. My parents try to give things need but me have many brothers and sisters at home so my father and new mother not always give me all me need to school" (Verbatim expression by a pupil in sign language)*

This was translated by the researcher to:

> *"My mother left me with my father when I was young and my step mother took care of me. I am not happy that am with deafness. My parents try as much as they could to provide my needs but due to the number of siblings my father and step mother have they are unable to give me all that I need for school"*

> *"My parents not go school before but support me education. They give me money to school, pay me school dues like Parents Teacher Association dues, and buy books many for me"(Verbatim expression by a pupil in sign language.*

This was translated by the researcher as:

> *"My parents are illiterates but support my education. They give me money to school, pay my Parents Teacher Association dues and then buy books for me*"

The views of the pupils were confirmed by what the teachers said:

In the view of one teacher:

> *"The support of some parents as far as their wards' with deafness is concern is not the best. Some of these parents do not provide the needs of their children in school. Some of the pupils do not have exercises books, notebooks, pens, pencils and others(Verbatim expression by a teacher)*

Another teacher explained:

> *"Some of the parents are interested in supporting their children by providing most of their needs but due to the number of children they have, they are unwilling to cater for all of them" (Verbatim expression by a teacher.)*

One teacher remarked:

> *"An interaction with some of the pupils with deafness revealed that some of the parents of pupils with deafness are not willing to invest even the smallest amount of money on the need of the children. They are more interested in buying funerals clothes and other things for themselves"(Verbatim expression by a teacher).*

The interview responses indicated that parental support as far as pupils with deafness is concern is not good. Most of the pupils with deafness lack some of the basic things needed for school. Some of them take care of themselves and must absent themselves from school in order to sell fish and sometimes coconut to get money to provide some of their needs. Pupils with deafness must be supported both at home and in school just like some of their hearing counterparts. This would prevent absenteeism, reduce low self-esteem and improve academic performance.

CHAPTER FIVE

DISCUSSIONS OF FINDINGS

5.0 Introduction

This chapter presents the discussions of findings on the performance of pupils who are deaf in the basic mathematical operations with reference to the research questions raised for the study. The findings of the interview data gathered were grouped to answer the research questions posed in chapter one. These research questions are:

1. What is the nature of the performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba?
2. What are the factors that influence the performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba?
3. What teaching methods do teachers use in teaching and learning basic mathematical operations at the University Practice South Inclusive School in Winneba?
4. What strategies are put in place to improve on the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba?

5.1 Research Question 1: The nature of the performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba.

The analysis of the interview data on research question one which focused on the nature of performance of pupils with deafness in the basic operations were categorized under the following sub-themes:

- Learning mathematics
- performance of pupils in the basic mathematical operation
- Difference in teaching pupils with deafness and their hearing counterparts.

Learning mathematics emerged as one of the sub themes of the analysis for research question one (1). The interview data revealed that majority of the pupils with deafness even at home have some level of interest and anxiety for learning mathematics. They perceive mathematics as an integral part of life and necessary for their survival in daily life and as such, are mandated to learn it though it is difficult and complex. This corroborated with Barbosa (2014) with support from Piaget who posited that children develop mathematical knowledge informally in the home with parents who require them to count, share and group things. Barbosa (2014) again, said children learn mathematical concept before they go to school. They supported this claim by arguing that preschool children can discriminate between different sets of objects on the basis of their numbers and can also reproduce a set of objects with the same numbers. All these daily life activities involved the use of mathematics. People later view mathematics as very important because young children showed mathematics knowledge in the home even before school (Claessens & Engel, 2013).This also supports Badura's social cognitive theory which stated that

performance of pupils can be influenced by his or her behavior, personality and the environment. The way the subject would be taught, would determine the interest the pupil would have towards that subject.

In this study, parents who have pupils who are deaf were not interviewed as to how they communicate with their wards. Claessens and Engel (2013) asserts that children who are deaf especially those born to hearing parents lack incidental learning because their parents are unable to communicate with them using sign language. Also, in our society, specifically University Practice South Inclusive school, pupils who are with deafness are in minority and can scarcely see other pupils who are with deafness communicating in sign language for them to learn incidentally from them. They further claim that the inability of pupils with deafness benefiting from incidental learning which prepares them for later mathematical learning has resulted in the challenges many of them face in learning the basic operation in mathematics (Claessens & Engel, 2013).

Concerning pupils' performance in the basic operation as an emerging theme, the interview data analyzed revealed that majority of the pupils performed below average due to their deafness. According to Traxler (2000), the difference between the achievement of pupils with deafness and their hearing pupils in the basic operations in mathematics is enormous. This is because pupils with deafness lag behind compared with their hearing counterpart. This necessitated concern raised by stakeholders such as teachers, parents, researchers and policy makers about the low achievement of pupils with deafness in the basic operations in mathematics. According to Swanwick and Oddy (2005) several research studies between 1980 and 2000 indicated that children with deafness lag in the basic operations compared with their hearing peers by 2 to 3.5 years. Nunes (2004) conducted a study and found out that, the

performance of pupils with deafness in mathematics is not encouraging enough. He noted the unsatisfactory performance of pupils with deafness in mathematics started before formal education as their hearing parents are unable to communicate with them in the home in sign language. Some researchers also posited that pupil's performance in mathematics have greater influence on their future career and earnings than the influence of reading ability (Kelly, 2003). Despite this view by Kelly (2003), the researcher thinks that mathematics is important to every individual because it involves everything we do in life. However, both mathematics and reading are necessary as they can both have influence on an individual's earning in future.

Relating to difference in performance of pupils with deafness and their hearing counterparts at University Practice South Inclusive School, the teachers revealed through the interview that, majority of the pupils are less motivated to study mathematics because of their family economic background and self-perception. Some of the pupils have no exercise books, pens and other relevant leaning materials for studying. Most of the pupils come to school without ample preparation for class activities and work. Others also feel that they are limited by their disability and as a result, are not willing to challenge themselves to work hard. The teachers further blamed the school and government for not doing much for pupils with deafness and suggested remedial teaching for the pupils with deafness.

This is confirmed in literature according to Raquel (2012) that many factors influence both the rate and enjoyment of learning in the classroom. One such factor is motivation. Grouws (2004) also said that instruction should be provided in bits and that can help them understand patterns and measurement and develop a solid understanding of the numeration system. At that stage, Grouws states that pupils should be encouraged to be inquisitive and this would help them develop and

investigate solutions to everyday problems. Instruction should focus on addition, subtraction, multiplication and division. The teacher should also try and accept divergent views from pupils during teaching and learning but encourages pupils to tell why and how they arrived at a solution or choose a particular method. Teachers are not to speak when facing the blackboard (Grouws, 2004).

5.2 Research Question 2: The factors that influence performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba

The analysis of the interview data on the factors that influenced performance of upper primary pupils who are deaf in the basic operations under research questions two had the following sub themes:

- availability of adequate teaching and learning materials
- mode of communication
- parental support
- challenges in the teaching and learning of basic mathematical operations to pupils who are deaf.

Concerning mode of communicating as an emerging theme, it was revealed through the interview data that the teachers communicate with the pupils using total communication which are speech and oral communication. The participants emphasized that the school is an inclusive school with pupils with and without deafness and because the teachers are not deaf themselves, they sometimes forget to sign all what they say and that makes it difficult for the pupils with deafness to fully understand the topic taught. Also, some of the participants stated that pupils without deafness were more than those with deafness and this also made some of their

teachers forget to sign during instruction. Again, they stated that some of concepts did not have its equivalent sign language.

In relation to parental support for their wards with deafness in mathematics in this study, the interview data revealed that some of the pupils faced parental neglect and this situation affects their ability and willingness to fully participate in school. Some level of support from their teachers gave some of the pupils with deafness relief. These findings were consistent with existing literature. According to Bulletin of Institute of Adult Education 48th Annual New Year School (1996) cited in Gadagbui (2012), "for every pupil or student who does well and gets through the educational system, there is a parent who was there every step of the way" Therefore the support from the home is very necessary in ensuring the academic success of pupils with deafness. The type of home a child comes from determines the success of that child in the school. In Ghana and other developing and developed countries, children live with either both parents, single parent, extended family or a relative and such is the community this study took place (Gadagbui, 2012).

Teaching and Learning Materials (TLM) emerged as one of the sub-themes under research question two. The interview data analyzed revealed that teachers used teaching and learning materials to complement their teaching and this assist pupil to better comprehend what is taught in class. It was also revealed that the major teaching and learning materials used by teachers are the chalk board and cardboard illustrations containing mathematical operations, stones and counters. Literature suggests that pupils with deafness are by nature visual learners and they learn and understand lessons best when adequate teaching and learning materials are used in teaching them (National Research Council of Kenya, 2012). Studies have shown that using pictures, charts and other multimedia methods of teaching mathematics to pupils with deafness

enhances understanding as compared to others that do not involve pictures and charts (National Research Council of Kenya, 2012). According to Mokgaetsi (2009), most of these teaching and learning materials and devices which are mostly visuals are not available in most Ghanaian schools. This means that pupils may fail to understand simple basic operation such as subtraction and addition and this would affect their performance. Challenges in the teaching and learning of basic operations emerged as a sub-theme under research question two (2). It wasit revealed through the interview that there was inadequate teaching and learning material in the school, the pupils were not intrinsically motivated to study coupled with truancy. Some of the teachers did not used sign language and then inadequate support from the home. The teachers confirmed they sometimes use chalkboard illustrations, cardboard illustrations, stones and counters to aid them in teaching pupils. However, most of materials that are visuals which would enhance effective understanding are not available in the school. Studies have shown that using pictures, charts and other multimedia methods of teaching mathematics to pupils with deafness enhances understanding as compared to others that do not involve pictures and charts (National Research Council of Kenya, 2012).

The data analyzed revealed that some of the pupils were not motivated intrinsically to study mathematics. Some stated that due to their nature as pupils with deafness they cannot learn mathematics as their hearing counterparts. They perceive mathematics as difficult and harbor the perception that their disability contributes to their ability to excel in mathematics. This finding was confirmed in the literature that reason for their low achievement in mathematics according to Swanwick and Oddy (2005) was due to the nature of their deafness. However, it should be noted that deafness is only a sensory deficiency which causes damages to the auditory nerves,

the cochlea and associated structures (Lyson, 1996). This only inhibits the transmission of sound from the outer ear through to the inner ear (Turnbull, Turnbull III, Shank and Leal, 1995) and not their intelligence.

5.3 Research Question 3: The teaching methods teachers use in teaching basic mathematical operations at the University Practice South Inclusive School in Winneba.

Four main themes emerged from the data gathered under research question three. These are:

- discussion method
- question and answer method
- group work
- demonstration and activity method
- Pupil's class participation.

Concerning teachers' approaches to teaching mathematics, the interview data analyzed revealed that teachers used questioning and answer method, demonstration, discussion and group activities in teaching pupils and these approaches facilitated in learning processes. Conferring to the Kenyan Institute of Education, (2006) the methods of teaching mathematics to pupils with deafness can be categorized into two main groups namely heuristic and didactic according to (Kenyan Institute of Education, 2006). The heuristic method involves the use of active participation and involvement of learners. They include question and answer method, demonstrations method, investigations method, probing, group work and discussions. The didactic method involves the teacher being the sole authority as far as knowledge is concerned. The role of the learner is that of passive recipient of knowledge. Methods involved in this include lecture, deductive and inductive methods. The heuristic approach is

considered as the most appropriate in teaching mathematics to pupils who are deaf. However, the methods may change depending on the learner's ability and the nature of the topics. The National Council of Teachers of Mathematics of America (NCTM, 2000) recommends this approach as it involves both the learner and the teacher in the teaching and learning process. Teaching mathematics to pupils with deafness should incorporate the use of varied instructional strategies in teaching.

This finding is confirmed in literature, Pagliaro and Lang (2007) who suggested that many pupils who are deaf lag in mathematics due to the methods teachers employ in teaching them. In introducing new mathematical concepts to pupils with deafness, teachers should use methods that build on their previous knowledge and then adequate visual aids (Pagliaro & Lang, 2007). This would enable pupils to be part in the teaching and learning process and thus ensure effective learning of the new topic.

With all these methods, class participation emerged because it an integral part of the teaching and learning process. Pupils' enjoy and understand lessons better when they are involved in the teaching and learning process. The interview data analyzed suggested that pupils are involved in class activities by their teachers. The nature of the participation includes pupils solving problems on the board and this sometimes breeds fear and embarrassment when the pupil does not know the answer to the question. However, the participation of pupils during the teaching and learning process also enabled the pupils to enjoy the teaching and learning process because they are involved and this makes them understand the lesson better. It also gives all pupils equal opportunity and thus fulfills the inclusive we are practicing now in our schools.

5.4 Research Question 4: Strategies put in place to improve on the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba.

Themes that emerged from the data analysis on research question four (4) were:

- remedial teaching
- small class size
- reduction of curriculum content for schools
- training of teachers in sign language
- the use of appropriate teaching and learning materials
- parental involvement.

On remedial teaching, the interview data analyzed revealed that this strategy offered the opportunity for learners who are under performing to perform creditably. It also enables pupils especially those with deafness to understand properly what was previously taught and what was previously not understood. The pupils with deafness said when their teachers give them extra time, it enables them to enjoy lesson which they did not understood earlier on. The interview data gathered further revealed that the pupils as well as their teachers like remedial teaching. The pupils confirmed that they understood lesson better if the teachers go through again with them. The teachers on their part confirmed that remedial teaching is good especially for pupils with deafness because they learn at a slow pace however, they complained of their inability in offering remedial teaching always to their pupils due to time.

With regards to small class size, the interview data analyzed gathered revealed that teachers and their pupils complained of the large class size and its negative effect on the teaching and learning process. A teacher who has to work with a large a class size would undoubtedly have his performance hindered and this would have a

negative effect on his pupils. Large class sizes was one of conditions that might affect the performance of teachers in most Ghanaian schools. This increase in class size brings the problems of ineffective class management, poor supervision of assignment and ineffective teaching and pupil teacher relationship. Small class size is the most appropriate.

The teachers and the pupil's comments on large class revealed that number of the pupil in the class should be reduced to at least twenty five (25). This would enable the teacher who speaks and sign at the same time during the learning process to attend to the individual needs of pupils in the classroom.

Reduction of curriculum content is another sub-theme under research question four. Data gathered revealed that the pupils with deafness learn at a very slow pace and repetition of lesson helps them understand concept better. However, due to the several subjects taught in schools teachers have little time to be repeating lessons for a long time. It would be appropriate if the curriculum content for schools is reduced so that pupils especially those with deafness would be able to excel just like some of their hearing peers who perform well in the subject. Also, it was revealed both the pupils and teachers wished the curriculum for the pupils are reduced so that there would have adequate time to concentrate and repeat lesson for easy understanding. The government should consider designing a curriculum for mathematics with reduced content so that pupils with deafness would also excel in the subject.

On the strategies for improving on the teaching and learning of basic mathematical operations, training of teachers in sign language was another sub-theme that emerged. Data gathered from the interview showed that teacher who is also an interpreter teaches using oral language and signs at the same time to the pupils with deafness. This means that when information is sent by the teacher, he or she translates

it using sign language so that the pupils with deafness would also benefit just as their hearing counterparts. However, in a situation where the teacher cannot communicate to those with deafness, the pupils with deafness would not benefit from the learning process. Data gathered also confirmed that some of the teachers in the school are not trained in sign language. This makes teaching and learning very difficult especially to the pupils with deafness. Such teachers therefore need to be train in sign language or employ interpreters to interpret the information to the learners with deafness. Literature recommends in support of these findings that teachers should use sign language considering its parameters which includes orientation, location, hand shape and appropriate facial expression (Oppong, 2007).

The use of appropriate teaching and learning materials was a sub-theme that emerged under research question four (4). Data gathered from the interview showed that the teachers use chalkboard illustrations, cardboard illustrations, counters and stones to aid them in teaching pupils. The teachers highlighted that the use of teaching and learning materials enhances the understanding of concepts. They agreed that mathematics concepts are abstract and without some real activity or picture to show to the pupil with deafness, it would be difficult to assist them. These concrete materials make it easier for pupils to understand the various concepts taught but most of them are not available in the school. Teachers sometimes improvised to make understanding better for the pupils. Tailor made or improvised teaching and learning materials which are catchy and relevant to the topic would help improve the performance of deaf pupils in the basic operations in mathematics when teaching them (Oppong, 2007).

Regarding parental involvement, the interview data showed that most of the parents are not adequately supporting their wards education. Most of these children

take care of themselves. Some of the pupils with deafness interviewed revealed that they sometimes must absent themselves from school in order sell fish and sometimes coconut before they can get money to buy their needs and food to eat. The pupils revealed that most of the support receives from some benevolent organization and individuals are not given to them by their parents. These supports are rather given to their siblings without disabilities. They were very grateful to their teachers because some of them receive books, food, encouragement and sometimes money from their teachers.

This is consistent with literature, people with disabilities especially those who are with deafness are more likely to be poor compared with their hearing people. It has been estimated that 20% of the world population living in poverty are people with disabilities (DFID, 2010). According to UNESCO (2010a), one third of the 72 million learners of primary school age who were not in school by 2007 have a disability and that over 90% of learners with disabilities in the world's poorest countries do not go to school. Out of the estimated 150 million learners living with disabilities worldwide, about four in five learners are in developing countries where many live in poverty. Researchers found out that urban parent are supportive in their wards' education than parents in the rural areas. Poverty has a negative influence on the parental involvement of pupils' academic performance. Pupils with deafness must be supported both at home and in school just like some of their hearing counterparts. This would prevent absenteeism, reduce low self-esteem and improve academic performance.

5.5 Conclusion

In this chapter, the findings provided by the interview and the records of the pupils in chapter four have been discussed in relation to the literature reviewed for the study. This chapter discussed the research findings on the nature of performance of upper primary pupils who are deaf in the basic operations, followed by the factors that influence the performance of pupils who are deaf in the basic mathematical operations. Thirdly, it discussed the teaching methods teachers use in teaching the basic mathematical operations and the fourth research question was on strategies put in place to improve on the teaching learning of the basic mathematical operations.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the summary, conclusions, and recommendations made based on findings of the study.

6.1 Summary of the study

The purpose of the study was to explore the performance of upper primary pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba. It was a qualitative research that employed the case study research design. It sought to fulfil the four objectives formulated to guide the study. These were to:

1. Explore the nature of performance of pupils who are deaf in basic mathematical operations at the University Practice South Inclusive School in Winneba.
2. Identify the factors that influence the performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba.
3. Examine the teaching methods teachers use in teaching the basic mathematical operations at the University Practice South Inclusive School in Winneba.
4. Identify the strategies that are put in place to improve on the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba.

To achieve these objectives, four research questions were formulated.

These were:

1. What is the nature of performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba?
2. What are the factors that influence performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba?
3. What are the teaching methods teachers use in teaching the basic mathematical operations at the University Practice South Inclusive School in Winneba?
4. What are the strategies put in place to improve the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba?

The study was conducted in Winneba in the Central Region of Ghana. The population of the study comprised of pupils with deafness and their teachers in the University Practice South Inclusive School in Winneba. The purposive sampling was used to sample seven pupils and five teachers for the study. A semi structured interview guide was used to collect data from the pupils. Pupils' class test and end of term examinations were used to support their performance. Data collected was analysed thematically. The following findings emerged from the data collected.

The first research question was to explore the nature of performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba. Emerging themes were related to:

- pupils learning mathematics
- performance of pupils in the basic operations (addition, subtraction, multiplication and division)

- Difference in teaching pupils who are deaf and their hearing counterpart.

It was evident that some of the pupils like learning the mathematics. This was because according to them it enabled them to add, subtract and count and change money without being cheated. Some of the pupils noted categorically that they do not perform well just like their hearing counterparts especially in subtraction.

The second research question explored the factors that influence performance of pupils who are deaf in the basic mathematical operations at the University Practice South Inclusive School in Winneba. Themes that emerged from the data gathered were related to:

- availability of adequate teaching and learning materials
- mode of communication
- parental support
- challenges in the teaching and learning of basic mathematical operations to pupil who are deaf.

It was realized that if there are adequate teaching and learning materials, teachers using sign language during instruction, massive parental support and addressing the challenges in teaching the basic operations, pupils who are deaf would excel.

The third research question also looked at the teaching methods teachers use in teaching the basic mathematical operations at the University Practice South Inclusive School in Winneba. Themes that emerged which were related to the following:

- Discussion method
- question and answer method
- group work

- demonstration and activity method
- Pupils class participation.

The fourth research question explored the strategies put in place to improve the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba. Themes that emerged from the data analysis were:

- remedial teaching
- small class size
- reduction of curriculum content for schools
- training teachers in sign language
- the use of appropriate teaching and learning materials
- parental involvement.

6.2 Conclusion

The study concluded that pupils who are deaf perceived mathematics as difficult and complex. They therefore performed below average in individual class exercises. However, they perform better in addition and multiplication than in subtraction and division. Teachers perceived teaching pupils who are deaf more challenging than hearing pupils.

The study also concluded that factors that influenced the performance of pupils who are deaf were inadequate parental support, inadequate teaching and learning materials, lack of effective communication among others.

Other issues identified were the teaching methods teachers used in teaching the basic mathematical operations which include: the use of discussion methods, question and answer method, group work, demonstration and activity method among others.

The study also concluded that the strategies put in place to improve the teaching and learning of basic mathematical operations on pupils who are deaf include remedial teaching, small class size, reduction of curriculum content, training of teachers in sign language, the use of appropriate teaching and learning materials, parental involvement.

6.3 Recommendations

The following recommendations were made based on the findings from the study.

1. The Special Education Unit of the University Practice South Inclusive School in Winneba and the head teachers of the school should demystify the perception of mathematics been a difficult subject and make it more interesting to attract pupils with deafness. Teachers need to focus more on the teaching of subtraction and division. More sign language interpreters and more instructional period and materials should be allocated to pupils who are deaf to eradicate the idea by some teachers that teaching them is more challenging.
2. The Parent Teacher Association (PTA) of the school should educate parents on the need to support their wards who are deaf to enable them concentrate during instruction. The head teacher should ensure that teachers, parents and pupils who are deaf upgrade their sign language skills periodically.
3. The head teacher of the school should ensure that teachers vary their methods of teaching subtraction and division. Pupils who are deaf should be allowed to work in groups to improve the understanding during instruction.
4. The head of the school should ensure that teachers use adequate teaching and learning materials to enhance understanding during lessons. This is because pupils who are deaf are visual learners and thus learn best through their sight.

The Parent Teacher Association, (PTA) should educate parents on the need to support their wards especially those who are deaf.

6.4 Suggested areas for further research

This study focused on the performance of upper primary pupils who are deaf in the basic mathematical operations at the University Practice Inclusive School, South Campus, Winneba. This study was a qualitative investigation, future researchers should approach this phenomenon with a mixed method approach to further triangulate the findings of the study. The sample of the study was limited to only pupils who are deaf, future studies should inculcate other forms of disability such those with and those without intellectual disabilities.

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APPENDICES
APPENDIX A

LETER OF INTRODUCTION

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FACULTY OF EDUCATIONAL STUDIES
DEPARTMENT OF SPECIAL EDUCATION
P. O. Box 25, Winneba, Ghana
+233 (020) 2041069
sped@uew.edu.gh

February 26, 2018

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.....

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Dear Sir/Madam,

LETTER OF INTRODUCTION

I write to introduce to you, Ms. Ruth Quaye an M.Phil student of Department of Special Education of the University of Education, Winneba with registration number 8160150005.

She is currently working on her thesis on the topic: *"Performance of Upper Primary Pupils with deafness in the basic mathematical operations at the University Practice Inclusive School South Campus, Winneba"*.

I should be grateful if you could give her the needed assistance to enable her to conduct a study from your school. This forms part of the requirements to complete her programme.

Counting on your cooperation.

Thank you.

Yours faithfully,

YEKPLE YAO E. (PHD)
AG. HEAD OF DEPARTMENT

APPENDIX B

INTERVIEW GUIDE

Dear respondent,

I am Ruth Quayea post graduate student at the University of Education, Winneba carrying out a research on Performance of Upper Primary Pupils with Deafness in the Basic Mathematical Operations at University Practice South Inclusive School in Winneba. Your school has been selected for the study. The information you will provide is purely for academic purposes and will be treated with the highest degree of confidentiality. You are therefore required to be as objective as possibly in your responses. You need not to give the details of your identity.

INTERVIEW QUESTIONS FOR PUPILS WITH DEAFNESS

Sr.NO. ---------- DATE: ____/____/____

SECTION A: BIO DATA

1. What class are you? ----------

2. What is your age? ----------

3. What is your date of birth? ----------

4. Gender (a) Male (b) Female

T*he nature of performance of upper primary pupils with deafness in the basic mathematical operations.*

1. Is mathematics studied in your school?
2. What do you like about mathematics?
3. What don't you like about mathematics?

4. Do you think mathematics is important?
5. Do you know the basic mathematical operations?
6. How do you perform in the basic operations?
7. How often do you learn the basic mathematical operations?
8. How often do you have class activities on the basic mathematical operations?
9. How would you rate your performance in the basic mathematical operations?
10. Why do you think makes you to do well in your homework and do not do well with your classwork?

What factors influence performance of pupils with deafness in the basic mathematical operations?

1. What is your attitude towards mathematics?
2. What teaching and learning materials do your teachers use when learning the basic mathematical operations?
3. How often do they use them?
4. How do your teachers communicate with you during mathematics lessons?
5. How has your parents been helpful in your education?
6. Do you have the interest in learning the basic mathematical operation?
7. Would you say deafness interferes with your ability to learn mathematics?
8. What challenges do you encounter when learning mathematics?
9.

What approaches are used when teachingand learning the basic mathematical operations?

1. Are you involved during the teaching and learning process?
2. How do your teachers teach the basic mathematical operations?
3. Do you understand the operations based on the approaches teachers used?

What strategies are effective in learning the basic mathematical operations?

1. Do you enjoy your mathematics lesson?
2. What strategies or teaching methods are used in teaching you?
3. Which aspect do you like?
4. Does the method used by teachers in teaching help you to understand the mathematics lesson?
5. How do you want your teachers to teach the basic mathematical operations?

INTERVIEW QUESTIONS FOR TEACHERS

What is the nature of deaf pupils' performance in the basic mathematical operations?

1. How different is the performance of deaf pupils in the basic mathematical operations?
2. How different is the teaching of deaf pupils and their hearing pupils?

What factors affect deaf pupil's performance in the basic mathematical operations?

1. What teaching and learning materials do you use when learning the basic mathematical operations?
2. What are some of the problems that affect your teaching pupils with deafness?

What approaches are used when learning the basic mathematical operations?

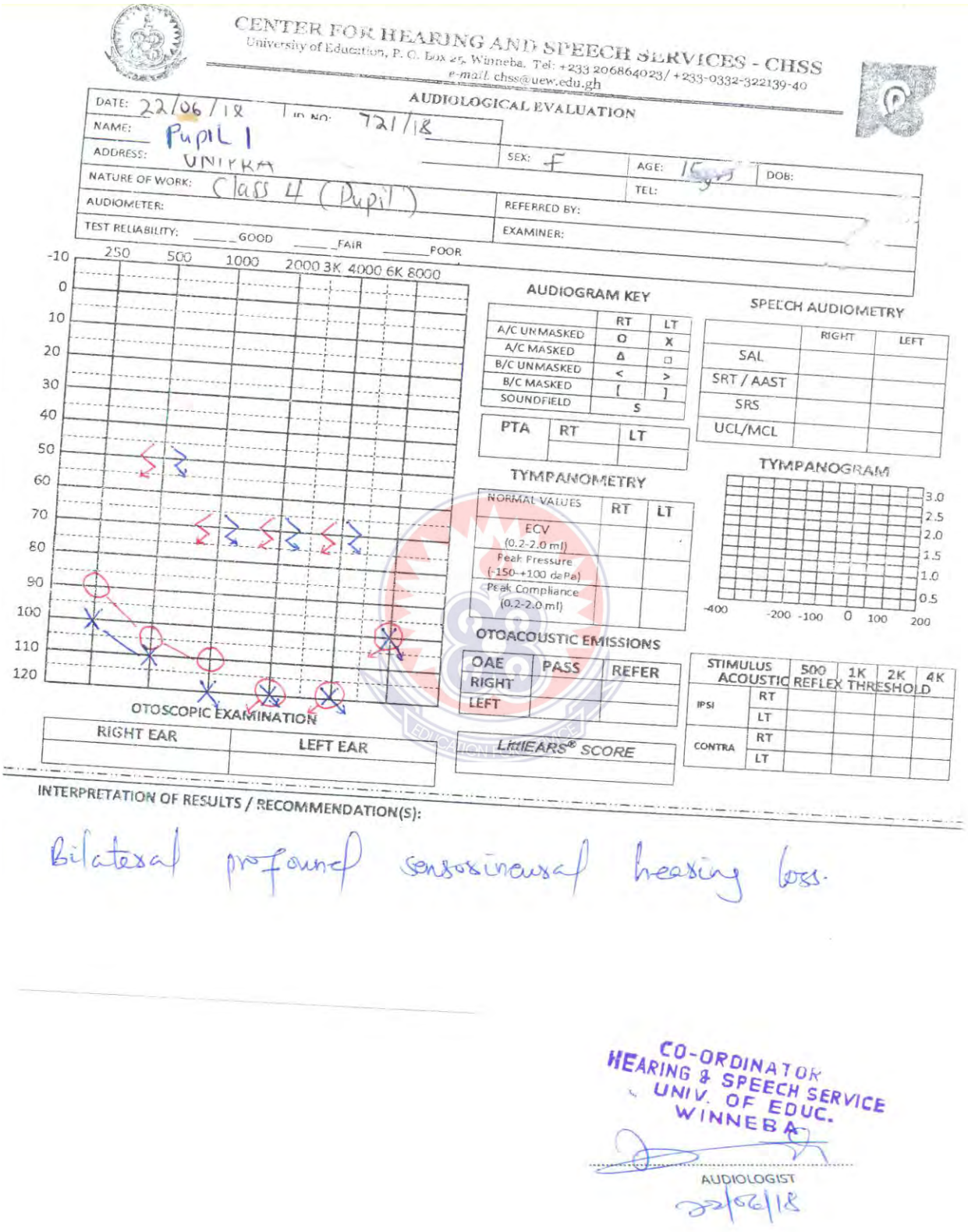
1. What approaches do you use when teaching basic mathematical operations to deaf pupils?

What strategies can be used to improve teaching and learning of mathematics?

1. What can you do to make your lesson interesting to deaf pupils?
2. How are parents of deaf pupils supporting their wards education?
3. How has sign language been helpful to pupils with deafness during mathematics lesson?
4. How has teaching aids been useful in mathematics instruction?

APPENDIX C

AUDIOGRAPH OF PUPILS WITH DEAFNESS



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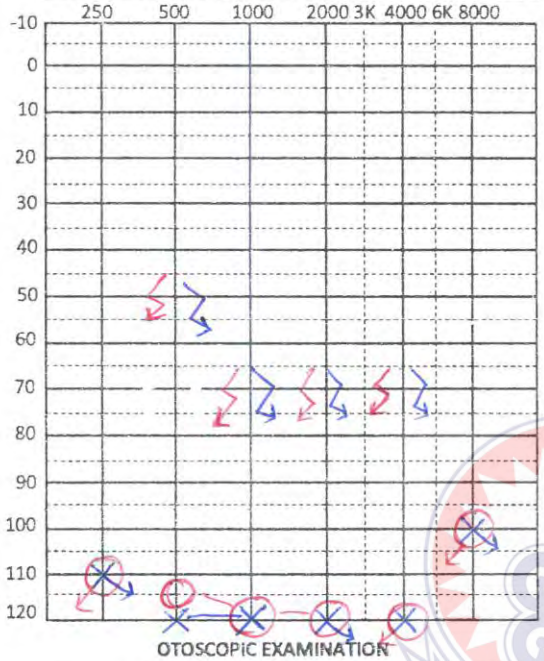
University of Education, P. O. Box 25, Winneba. Tel: +233 206864023/ +233-0332-322139-40
e-mail: chss@uew.edu.gh

AUDIOLOGICAL EVALUATION

DATE: 22/06/18	ID NO: 717/18			
NAME: Pupil 2		SEX: F	AGE: 14yrs	DOB:
ADDRESS: NI-PRA			TEL:	
NATURE OF WORK: Class 5 (pupil)		REFERRED BY: Class teacher		
AUDIOMETER:		EXAMINER:		
TEST RELIABILITY: ____GOOD ____FAIR ____POOR				



AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

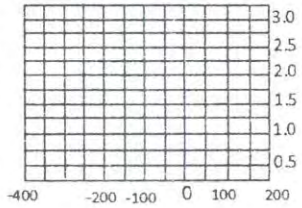
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

TYMPANOGRAM



OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR

LittlEARS® SCORE

INTERPRETATION OF RESULTS / RECOMMENDATION(S):

Bilateral profound sensorineural hearing loss.

CO-ORDINATOR
HEARING & SPEECH SERVICE
UNIV. OF EDUC.
WINNEBA

AUDIOLOGIST
22/06/18

CENTER FOR HEARING AND SPEECH SERVICES - CHSS

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e-mail: chss@uew.edu.gh

AUDIOLOGICAL EVALUATION

DATE: 22/06/18 ID NO: ~~7HR~~ 7HR/18

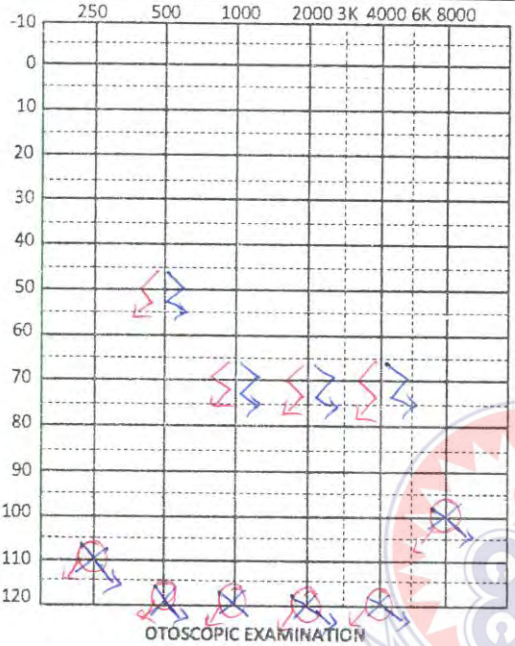
NAME: Pupil 3 SEX: M AGE: 14yrs DOB:

ADDRESS: UNIKKA TEL:

NATURE OF WORK: Class 5 (pupil) REFERRED BY: Classteacher

AUDIOMETER: EXAMINER:

TEST RELIABILITY: _____GOOD _____FAIR _____POOR



OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR

AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

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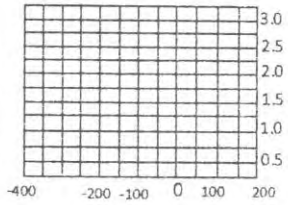
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOGRAM



STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

INTERPRETATION OF RESULTS / RECOMMENDATION(S):

Bilateral profound sensorineural hearing loss

CO-ORDINATOR
HEARING & SPEECH SERVICE
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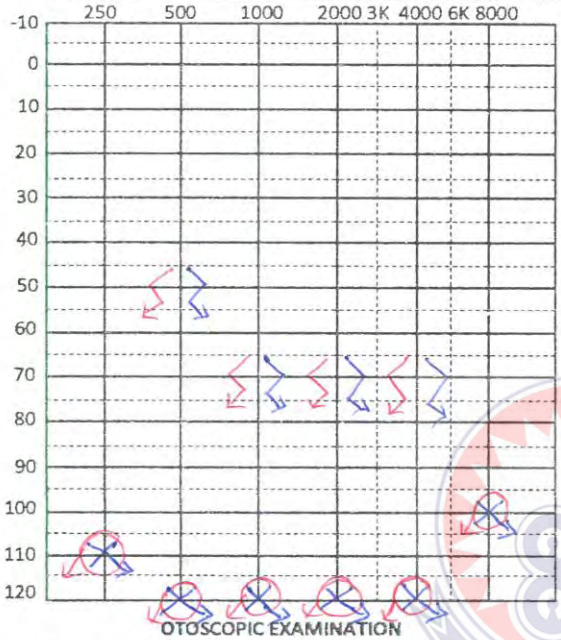
e-mail: chss@uew.edu.gh

AUDIOLOGICAL EVALUATION

DATE: 22/06/18	ID NO: 722/18		
NAME: Pupil 4	SEX: F	AGE: 12yrs	DOB:
ADDRESS: UNIPRA		TEL:	
NATURE OF WORK: Pupil	REFERRED BY: Class teacher		
AUDIOMETER:	EXAMINER:		
TEST RELIABILITY: ____GOOD ____FAIR ____POOR			



AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

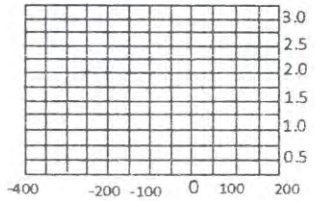
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

TYMPANOGRAM



OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR
NAD	NAD

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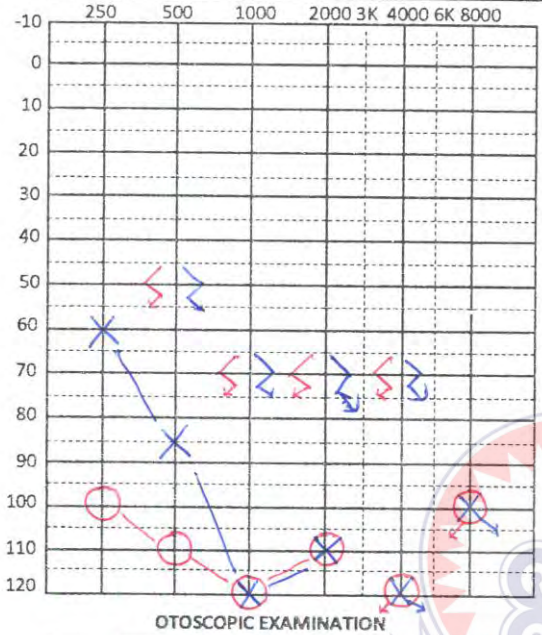
22/06/18

CENTER FOR HEARING AND SPEECH SERVICES - CHSS
University of Education, P. O. Box 25, Winneba. Tel: +233 206864023/ +233-0332-322139-40
e-mail: chss@uew.edu.gh

AUDIOLOGICAL EVALUATION

DATE: 22/06/18	ID NO: 720/18		
NAME: Pupil 5	SEX: M	AGE: 13yrs	DOB:
ADDRESS: UNIFRA		TEL:	
NATURE OF WORK: Class 5 (Pupil)		REFERRED BY: Class teacher	
AUDIOMETER:		EXAMINER:	
TEST RELIABILITY: ____GOOD ____FAIR ____POOR			



AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

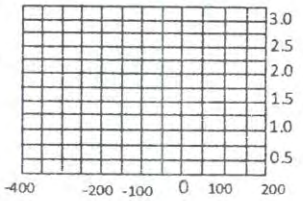
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

TYMPANOGRAM



OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR

LittEARS® SCORE

INTERPRETATION OF RESULTS / RECOMMENDATION(S):

RIGHT EAR: Profound sensorineural hearing loss.
LEFT EAR: Moderately severe (250Hz), Severe (500Hz) in the low frequencies with profound loss in the middle and high frequencies - sensorineural hearing loss.

CO-ORDINATOR
HEARING & SPEECH SERVICE
UNIV. OF EDUC.
WINNEBA

AUDIOLOGIST
22/06/18

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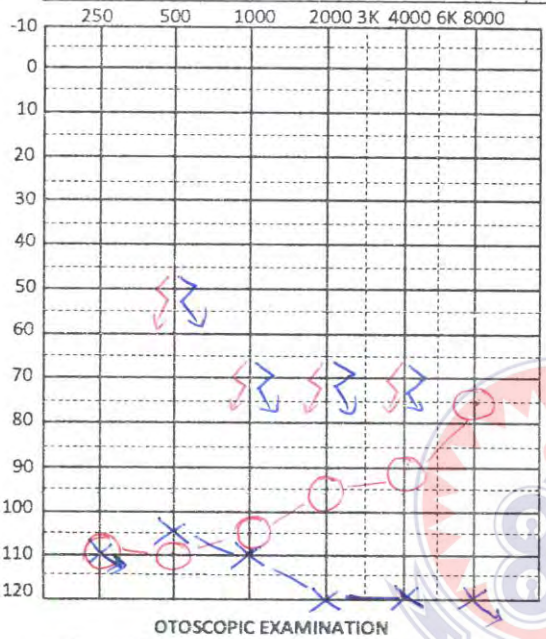
AUDIOLOGICAL EVALUATION

DATE: 22/06/18	ID NO: 716/18		
NAME: Pupil 6	SEX: M	AGE: 11yrs	DOB:
ADDRESS: UHIPPRI		TEL:	
NATURE OF WORK: Class 4 (Pupil)	REFERRED BY: Class teacher		
AUDIOMETER:	EXAMINER:		
TEST RELIABILITY: ____GOOD ____FAIR ____POOR			



AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

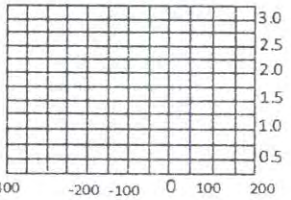
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

TYMPANOGRAM



OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR

LittlEARS® SCORE

INTERPRETATION OF RESULTS / RECOMMENDATION(S):

PURE TONE AUDIOMETRY
LEFT EAR: Profound sensorineural hearing loss.
RIGHT EAR: Severe to profound severe slope sensorineural hearing loss.

CO-ORDINATOR
HEARING & SPEECH SERVICES
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WINNEBA

AUDIOLOGIST
22/06/18

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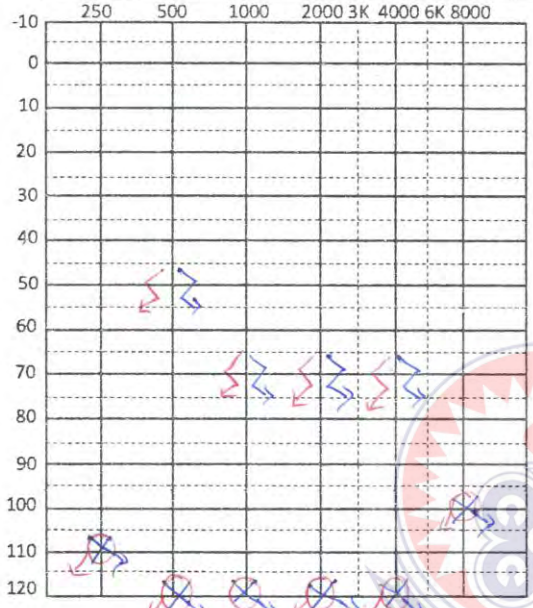
AUDIOLOGICAL EVALUATION

DATE: 02-06-18	ID NO:			
NAME: Pupil 7		SEX: M	AGE: 14yrs	DOB:
ADDRESS: UNIPRA			TEL:	
NATURE OF WORK: pupil (class 4)		REFERRED BY: class teacher		
AUDIOMETER:		EXAMINER:		
TEST RELIABILITY: _____GOOD _____FAIR _____POOR				



AUDIOGRAM KEY

	RT	LT
A/C UNMASKED	O	X
A/C MASKED	Δ	□
B/C UNMASKED	<	>
B/C MASKED	[	]
SOUNDFIELD	S	

PTA	RT	LT

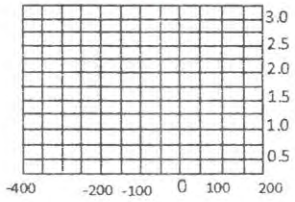
SPEECH AUDIOMETRY

	RIGHT	LEFT
SAL		
SRT / AAST		
SRS		
UCL/MCL		

TYMPANOMETRY

NORMAL VALUES	RT	LT
ECV (0.2-2.0 ml)		
Peak Pressure (-150-+100 daPa)		
Peak Compliance (0.2-2.0 ml)		

TYMPANOGRAM



OTOACOUSTIC EMISSIONS

OAE	PASS	REFER
RIGHT		
LEFT		

STIMULUS ACOUSTIC REFLEX THRESHOLD		500	1K	2K	4K
IPSI	RT				
	LT				
CONTRA	RT				
	LT				

OTOSCOPIC EXAMINATION

RIGHT EAR	LEFT EAR

LittlEARS® SCORE

INTERPRETATION OF RESULTS / RECOMMENDATION(S):

Bilateral profound sensorineural hearing loss.

CO-ORDINATOR
HEARING & SPEECH SERVICE.
UNIV. OF EDUC.
WINNEBA

AUDIOLOGIST

02/06/18