



Teaching Strategies in Basic Mathematical Operations for Hearing Impaired Learners at the University Practice Inclusive School -South Campus, Winneba Ghana

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Abstract

The study investigates the teaching and learning strategies used in teaching Basic Mathematical Operations to learners who are hearing impaired in the University Practice South Inclusive School, Winneba. This study is a qualitative case study in which a total of 12 respondents were accessed during the study. This comprised five (5) teachers and seven (7) pupils from the upper primary level who were sampled using non-probability census sampling technique. Semi-structured interview guide and work sample analysis of pupils were used to collect data for the study. Data collected was analyzed thematically from the responses of respondents to the two research questions that guided the study. The study revealed that individual, home, school and teacher factors such as inadequate instructional aids and the use of sign language greatly influenced the teaching and learning outcomes of Basic Mathematical Operations to hearing impaired learners. From a summary of findings gathered from the study, it is recommended that school management boards educate parents during Parents Teachers Association meetings on the need to provide adequate support to their wards who fall under the challenge category of hearing impairment to enable them concentrate during instructional periods. Furthermore, the Special Education Unit and the Head-teacher of the school should ensure that teachers vary their pedagogy of teaching Basic Mathematical Operations by employing methods such as heuristic method, group work, repetition method and the use of games. This would improve the understanding of pupils who are hearing impaired in class and enhance the overall teaching and learning outcomes.

Keywords: Inclusivity, Teaching Pedagogies, Mathematics, Hearing Impairment, Teaching and Learning Outcomes

INTRODUCTION

Mathematics is very important in the education and development of children. 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). In Ghana, performance of learners who are hearing impaired in the basic mathematical operations has been a subject of educational attention for many years by various stakeholders such as teachers, parents, researchers and policy makers. 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 (Ghana Education Service, 2009). Following the researcher's experience in teaching; mathematical knowledge in addition, subtraction, multiplication and division are fundamental in 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 who are hearing impaired and those without hearing challenges must obtain a good grade in mathematics to enter Senior High School (SHS), and other tertiary institutions.

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 represents addition, - (minus) sign represents subtraction, * (times) sign represents multiplication, ÷ sign represents division (Anderson, Briner, Irons, Shield, Sparrow, & Steinle (2007). Findings from a research study between 1980-2000 proves that pupils who are hearing impaired lag behind hearing peers in the basic mathematical operations (Swanwick, Oddy & Roper, 2013). Research by the Ghana Education Service (2009), and Sekyere (2008) revealed that the achievement of pupils who are deaf in the basic mathematics was unsatisfactory. Respectively, their findings were based on the chief examiner's report on the performance of hearing-impaired candidates in the Basic Education Certificate Examinations (BECE) between 2000 and 2004 which indicated a decline in learner's performance during the stated period. Similarly, findings by Pagliaro, Foisack and Kelly (2010), showed same result.

The study was guided by the following research questions:

- i. What are the factors that influence performance of pupils who suffer hearing impairment at the University Practice South Inclusive School in Winneba in the study of basic mathematical operations?
- ii. What teaching strategies can be used in improving the teaching and learning of basic mathematical operations at the University Practice South Inclusive School in Winneba.

This study focuses on identifying the factors that influence the performance of hearing-impaired learners at the University Practice South Inclusive School – Winneba, in the teaching and learning of mathematical operations and the teaching strategies that can be employed for enhanced teaching and learning outcomes.

The study was underpinned by the Social-Cognitive Theory (1986) of Albert Bandura. This theory focuses on the immediate environment of the child and how it influences his/her cognition. Like the name suggests, it is a combination of the social and cognitive theories (Bandura, 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 includes appropriate school environment, location, teaching materials, teachers and pupils. The home environment includes the immediate surroundings, people, location/area, and parents. The cognitive generally deals with the mind-set of the pupil.

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 (Bandura, 1986). Human behavior is influenced by both personal/internal and environmental factors.

The theory opines that, the pupil (person) and the school and home (environment) each 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).

METHODOLOGY

In attempt to allow respondents room to freely share their experiences, this study employed the qualitative approach. Furthermore, this approach was adopted because the study explored performance of pupils who suffered hearing impairment in the study school. A Case Study design was employed to answer the research questions. The use of this design was appropriate because the study was on one particular school which was University Practice South Inclusive School in Winneba and it was convenient in collecting data from the pupils who suffered hearing impairment and their teachers respectively. The case study design was chosen because it enabled the study to delve deeper into the performance of pupils who are hearing impaired.

Semi structured interviews and document analysis which comprised the class test scores and end of term's examination records of the pupils who are hearing impaired learners in mathematics were used to gather data for the study. According to Hancock, (2002) the above named tools are appropriate for gathering data in such a study because it offers researchers the opportunity to gather data about cases involved in a study.

The Interview data was gathered over a period of 3 weeks and analyzed thematically from the various responses of respondents to the two research questions that guided the study. Interview dates were scheduled between respondents and the researcher within this period.

From a population of one hundred and thirty-five (135), twelve were sampled using non-probability census sampling technique. The sample size of twelve (12) respondents comprised four (4) basic four pupils with deafness, three (3) basic five pupils who are deaf and five (5) teachers. Basic four pupils who are deaf 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 sampled for these studies were five (5) teachers who were all females and special educators aged between thirty (30) and forty-five (45). This was executed in an attempt to gather the experiences of all potential respondents that were concerned with the subject.

RESULTS AND DISCUSSIONS

The discussions and findings have been organized into sections to reflect the key issues that the research questions seek to address. The study recorded the following as factors that account for the challenges faced by hearing impaired learners in University Practice South Inclusive School – Winneba, in the learning of basic operations in mathematics;

1. Home factors.
2. School factors.
3. Teacher factors.
4. Pupil/individual factors.

Home factors

Inadequate home support

The success of any child depends on the support that child has from the home Gadagbui (2012). According to the 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 who are hearing impaired. 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 (Gadagbui, 2012).

Further, Gadagbui (2012) posits that the atmosphere in the home influences 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. The situation is not any different in Winneba with the existence of quarrels between parents and other family members on the grounds of stigmatization. The study gathered that hearing-impaired learners did not receive adequate support at home and this partly contributed to the poor performance that reflected in their studies. The study gathered hearing impaired learners did not receive the necessary biological support at home as well as psychological and other basic upkeep needs.

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 and 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, may not be able to explain things to the ward. The study gathered that majority of parents who have their wards in University Practice South Inclusive School, Winneba were illiterates and this became a barrier where parents needed to afford some special support to their hearing-impaired wards at home.

School Factors

School Location and Facilities

Many schools still have poor physical infrastructure and many are shabby, dangerous, and unfit for human habitation (Ralenala's as cited in Mokgaetsi, 2009). This situation is close to same at the University Practice South Inclusive School, Winneba. No water and poor sanitation present at the school does not only affect the teaching and learning activities of the school but also threatens the health of learners and educators as well. University Practice South Inclusive School – Winneba, has no laboratory and this affects learner's performance. Mokgaetsi, 2009 opines that there is a strong relationship between learner performance and the quality of the facilities available to learners.

Large Class Size

There are large class sizes in the University Practice South Inclusive School, Winneba. Some class size number over 35 students. Class size has also been identified as another determinant and a motivating factor for better academic performance. A teacher (whether professional or not) who has to 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 are unfavourable conditions that affect the performance of teachers in the school. This causes challenges such as ineffective class management, poor supervision of assignments, ineffective teaching and poor pupil teacher relationships.

Teacher Factors

Inadequate Instructional Aids

Pupils who are hearing impaired are by nature visual learners and they learn and understand lessons best when adequate teaching and learning materials are used in delivering lessons to them. Studies have shown that using pictures, flash cards, counters, charts and other multimedia methods of teaching mathematics to pupils who are hearing impaired enhances understanding as compared to others that do not involve pictures and charts (National Research Council of Kenya, 2012).

The Use of Sign Language

Sign language is the tool pupils who are hearing impaired use in communicating among themselves (Siegel, 2008). In an inclusive school such as the 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 School were noted to have low performance in the basic mathematical operations and other subjects studied due to the fact that some of the teachers forget to sign using sign language while teaching because the learners without deafness are more than those who are deaf in the class. The study's data showed that teachers did not teach mathematical operations with efficient use of sign language. In some lessons, teachers did not employ the use of sign language at any given point of lesson delivery.

Pupil Factors

Pupils' Attitude Towards Learning

Respondents indicated that their hearing-impaired pupils showed poor attitude towards learning. The study established that this was as a result of; learner's low confidence level amid been 'different', incidences at home that influence the desire, as well as need and motivation (intrinsic and extrinsic) to attend school classes. These led to truancy. 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. (Curry, as cited in Mokgaetsi, 2009). 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 towards learning can be linked to the taxonomy of learning styles. (Curry, as cited in Mokgaetsi, 2009) contend that pupil's attitude to learning is based on their understanding of concepts. These concepts tend to develop two main attitudes in students towards learning, namely; positive attitudes and negative attitudes towards

learning (Mullins, in Mokgaetsi, 2009). The negative attitude towards learning could result in pupils performing poorly preventing them from obtaining required results for further studies.

Teaching Strategies In Basic Mathematical Operations To Hearing Impaired Learners

The Use of Adequate And Appropriate Teaching And Learning Materials

Teaching and Learning Materials are materials used by teachers to facilitate better understanding of lessons by pupils. Pupils who are hearing impaired who are visual learners understand lessons better when teaching and learning materials are involved. 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 are able to 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 provides enjoyment (National Research Council of Kenya, 2012).

The Use of Appropriate Methods of Teaching Basic Operations In Mathematics (Heuristic Method)

The heuristic method involves the use of active participation and involvement of learners. They include question and answer method, demonstration method, investigations method, probing, group work and discussions. The heuristic approach is considered as most appropriate in teaching mathematics to pupils who are hearing impaired. However, the methods may change depending on the learners' ability and the nature of the topics. Further, NCTM, (2000) recommends this approach as appropriate for teaching mathematics to pupils who are deaf because it involves both the learner and the teacher in the teaching and learning process.

Repetition Method

This is teaching method teachers can employ in teaching pupils in an attempt to help improve pupils' performance in mathematics. Repeating previous lessons enable pupils understand lessons better. As Wilson (2015) posits pupils need to be aware of the fundamentals in mathematics before they progress to another level. Repetition is a mechanism that makes lesson easier for pupils with challenges in mathematics. Repetition of lesson would enable pupils reflect on the previous lesson and this would help teachers introduce a new lesson based on pupil's previous knowledge.

Strategies for improving the Teaching and Learning of Basic Mathematical Operations

The interview data revealed that teachers teaching hearing impaired learners should use remedial teaching, heuristic method of teaching, teaching and learning materials, repetition method and the use of sign language to enhance understanding of learners in the basic mathematical operations.

One pupil who is deaf commented:

“Me enjoy lesson better if teacher teach slow down and give me more time and over again teach what teach past. Me understand. 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 the teacher reduces the pace of her lesson delivery, offers me more time and goes 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).

The researcher found out that in the classroom the teacher’s priority was 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 need to be improved.

Research conducted by Grouws (2004), is consistent with the findings of this study that teachers should establish a good academic relationship with the children they teach in order not to create fear and panic for the subject from that stage. This can be achieved by the teacher clarifying the purpose and learning goals and providing explicit criteria on how students can be successful in the subject (Grouws, 2004).

CONCLUSION AND RECOMMENDATIONS

This paper has attempted to discuss the teaching strategies in basic mathematical operations for hearing impaired learners. The researcher has outlined the factors that influence performance of pupils who are hearing impaired in the study of basic mathematical operations at the University Practice South Inclusive School in Winneba and the strategies put in place to improve on the teaching and learning of basic mathematical operations. This study recommends that the Special Education Unit of the University Practice South Inclusive School in Winneba and the head teachers of the school should educate parents during Parents Teachers Association (P.T.A) meetings on the need to support their wards that are hearing impaired to enable them concentrate during instruction. Again, teachers need to use methods such as heuristic method, repetition method, group work and the use of games in delivering lessons to class groups that have hearing impaired learners.

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