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Factors Inhibiting the Learning of Mathematical Skills among the Hearing Impaired Pupils in Basic Schools In Zambia

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Abstract: ***This paper is an extract from a PhD study on factors inhibiting the learning of mathematical skills among the hearing impaired pupils in Basic Schools in Zambia. It analyses the factors inhibiting the learning of mathematical skills, the nature of Mathematical skills taught, the instructional strategies used by the teachers in teaching Mathematical skills, the educational resources available for the teaching of Mathematical skills, availability of educational materials for teaching Mathematical skills, and the suitability of the available of the educational materials for teaching Mathematical skills to the hearing impaired pupils in Basic Schools in Zambia. As regards the factors inhibiting the learning of mathematical skills by the hearing impaired, these included lack of understanding of concepts of Mathematical skills by pupils, inadequate textbooks, negative attitude of teachers in the delivery of the curriculum, and teacher's lack of training in or knowledge of Sign Language.In terms of the nature of Mathematical skills taught to the hearing impaired pupils in Basic Schools in Zambia, these were addition, subtraction, multiplication and division of numbers.As regards availability of educational resources, these were not readily available. As regards suitability of the available resources, most of the books were not suitable for teaching the hearing impaired pupils because they were not presented in the form of concrete objects and that the materials presented in the books kept on changing now and then in relation to modern trends in education.***

Keywords: Mathematical skills, Hearing impaired, Basic Schools

1. Introduction

Zambia's national policy on the formal education of children with special educational needs (CSEN) began to evolve following the completion of a nation-wide campaign to reach disabled children (ZNCRDC), which was spurred by the UN declaration of 1981 as the International Year of Disabled Persons (IYDP). The campaign generated epidemiological estimates of the prevalence of various types of disability among the population of basic school age (5–15 years), that showed that existing (Serpell & Jere-Folotiya, 2011).

2. Findings

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

The findings of the current study revealed that 20 out of 44 teachers reported that language barrier was the major factor which inhibit the learning of mathematical skills among pupils with hearing impairment. Further, lack of specialized teachers and negative attitude of teachers towards sign language were other factors contributing to non-participation in mathematical skills among pupils with hearing impairment.

Table 1: Teachers' and Pupils' views on factors inhibiting the learning of mathematical skills

Factors	Teachers	Pupils
Language barrier	20	33
Negative attitude of teachers in the delivery of the curriculum	12	19
Lack of texbooks	8	13
Poor methodology	4	3
Lack of clear explanations of concepts	-	2
Total	44	70

Other factors according to the teachers included, inadequate textbooks and visual aids, poor methodology, and lack of clear explanation of concepts by the teachers. The lack of training and understanding of sign language by the teachers who teach pupils with hearing impairment is quite a saddening situation which requires immediate attention if these pupils were going to benefit from the subject. Cornelius (1982) asserts that the key to successful learning of mathematical skills among pupils with hearing impairment is sign language. Teachers who are not conversant with sign language are unable to interpret the contents of the syllabus and instructional materials for pupils to understand.

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

One teacher in the current study noted that without basic communication skills, pupils with hearing impairment have no idea what questions are being asked of them and what was expected of them. Pau (1995:4) suggested that 'verbal arithmetic problems contain certain linguistic forms which are particularly difficult for pupils with hearing impairment.' This sentiment requires that teachers become conversant

with basic communication skills and this can only be achieved through the use of sign language.

This inhibiting factor with regard to communication in learning mathematical skills among pupils with hearing impairment was also evident during observation of teachers. It became apparent that pupils with hearing impairment did not understand concepts in finding ratios and fractions they were being taught.

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

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

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

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

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

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

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

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

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

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

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

As regards instructional strategies used in teaching Mathematics to the hearing impaired pupils, the current study revealed that 61% of the teachers used demonstrations and question and answer method. Other instructional strategies teachers used included concrete objects and sign language in conjunction with visual aids. On the other hand, 62.9% of the pupils reported that teachers just explained concepts in sign language while 26 of them said that teachers used learning aids, books and sign language.

Bobis (2004) states that teaching mathematical skills at basic school to pupils with hearing impairment requires the use of

different strategies and varied methods such as the use flash numerical cards, large and small numerical cards, counters (umber concept), number line and dot pattern cards by well trained teachers.

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

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

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

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

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

Objective 4: Availability of educational resources for teaching mathematical skills to pupils with hearing impairments in Basic Schools

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

Objective 5: Suitability of the available educational resources for mathematical skills to pupils with hearing impairments in Basic Schools

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

3. Conclusion

The study has shown that there are several factors that inhibit the learning of mathematical skills among pupils with hearing impairments. Among the most prominent factor was the language barrier which denied these pupils the opportunity to learn, grasp, and understand the concepts. This resulted into pupils forgetting things easily because teachers found it difficult to explain things using sign language. Another factor was the lack of textbooks;most pupils with hearing impairment were frustrated because textbooks were not there to reinforce their learning. In some cases teachers also did not have textbooks to refer to.

Learning should be an integral thing, meaning that pupils with hearing impairment will only learn mathematical skills if all areas of curriculum delivery are touched and only if total communication is used.

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

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

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

In relation to the theoretical framework chosen for this study, Kambel (1977) argue that what pupils become before and after school depends on the relationship between the teacher and the pupil. The teacher contributes greatly to the integral growth of pupils with hearing impairment in class; the concerns and categories teachers use to define their pupils in class helps to shape the well-being of the pupil in future. For instance, teachers who use negative terms or words such as stupid, slow learner, low achiever and poor would discourage pupils with hearing impairment from effectively learning mathematical skills. In order to make this theoretical framework relevant to pupils with hearing impairment in Zambia, the researcher notes three sources of support, namely, support from classroom teachers, teachers using different types of instructional strategies, and the use of teaching and learning materials, including the use of improvised materials. Support from classroom teachers could be in form of interaction with pupils to help them acquire mathematical skills during mathematics lessons and also help them begin a different cycle of exploration in life. It has been observed that pupils with hearing impairments' actions and interactions with others contribute to their learning situation.

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

This action made the theory relevant to pupils with hearing impairment in Zambia. According to Hohmann and Weikart (2002) argued that children learn and discover relationships through teaching and learning materials. To this effect, the researcher realized that for pupils with hearing impairment to learn the concept of mathematical skills teachers need to use teaching and learning materials. The study took note of the three concerns in the classrooms, therefore, teachers should always make sure curriculum content is well organized, different strategies and teaching and learning materials are used. However, guided by this theoretical framework, the researcher managed to achieve the study objectives.

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

4. Recommendations

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

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

References

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