Teaching Methods Employed by Teachers and Their Influence on Academic Performance of Learners with Hearing Impairments in Mathematics in Igembe Sub-County of Meru County

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Abstract: **The purpose of the study was to establish teaching methods employed by teachers that have positive impact on academic performance of learners with hearing impairments in mathematics in special school and units in Igembe District of Meru County. This study adopted a descriptive survey design which allowed the researcher to gather, summarize, present and interpret the information /data for the purpose of clarification. The study targeted the head teachers, teachers teaching mathematics to hearing impaired learners and Quality assurance and standard officers in Igembe District. A sample of 53% of accessible population was purposively sampled for this study. The researcher used questionnaires, interview guides, and observation checklists to collect data. The researcher applied test-retest method during the piloting stage to establish reliability. This was carried out in one special unit of Tigania District which was purposively sampled to ensure validity of the research instruments. They were developed with consultation of fellow post graduate students and my supervisors. The data gathered from the field was sorted out, coded and analyzed in form of table, charts, frequencies, percentages and texts. The study established that teachers employ a variety of methods such as demonstration/illustration, question and answer method, peer tutoring, developing concepts in steps from simple to complex, use of many visual aids such as charts and counters, discussion, oral practice based on addition, subtraction, multiplication and division facts, group work where pupils with different levels of competency are grouped together to uplift one another, teach test where learners are given exercises to work on to gauge their competence and task analysis. The study concluded that the use of varied teaching methods enhances academic performance of learners with hearing impairment in mathematics. The study recommended that teachers should be employing varied teaching methods such as demonstration, participatory, educational technology and peer tutoring while teaching learners with hearing impairment in order to enhance their academic performance especially in mathematics.**

Keywords: **Hearing Impairments, Teaching Methods, Performance in Mathematics**

I. INTRODUCTION

Many countries regard education as a very important tool for social, economic and political development. Education gives knowledge and skills which are necessary in the production of goods and services (UNESCO, 2002). According to UNESCO (2002) education facilitates acquisition of altitudes, and competencies needed in the labour market and personal development. Present society is technologically oriented and information rich and therefore knowledge of mathematics is important and so children need to develop mathematical skills to be effective, contributing and confident member of the technologically oriented society (Govindan & Ramaa, 2014). Mathematics finds its application in the field of science, technology, economics and other arrays of life. But for a common man, knowledge of mathematics helps him understand the functioning of the world around him. The hearing impaired children, just as hearing children, are supposed to learn mathematics in order to live as successful, effective and independent individuals in the society. Studies show that children with hearing-impairment can learn mathematics just as their hearing peers but at a delayed pace (Traxler, 2000; Tanridiler, Uzuner & Girgin, 2015).

In the USA leveraging the use of mobile devices for education, such as instructional games, is an area of increasing interest for targeted sub-populations of students including those who are deaf/hard-of-hearing (DHH) (Shelton & Parlin, 2016). In their study on teaching math to deaf/hard-of-hearing (DHH) Children using mobile games, Shelton and Parlin (2016) indicated that students self-reported learning orienteering skills, and practiced reading to solve mathematical problems using mobile games. In Pakstan, Parvez, Khan, Iqbal, Tahir, Alghamdi, Alqarni, Alzaidi and Javaid (2019) argued that the learning methods of learners with hearing impairment are different as compared to hearing people. They use Sign Language (SL) rather than natural language to communicate and learn and hence they are required to put a lot of effort into learning different concepts using conventional pedagogies. Therefore, there is a dire need

for some assistive technology to improve their learn-ability and understandability. The findings revealed that the Experimental Group (EG) participants, who were instructed by mobile application showed higher proficiency in the quizzes as compared to the Control Group (CG). Moreover, a significant difference was also observed in the time taken by participants in both groups to complete the quizzes. This implies that adoption of technology as a teaching method can enhance performance in mathematics.

In South Africa have also been emphasizing on the use of participatory teaching methods (Prinsloo, 2000). For this case, UNESCO (2010) suggests that teachers need to develop pedagogies for the diversity, effective use of learning support, teachers and other human and material resources for full participation of learners. However many ordinary teachers face problems in instituting integrated programs within inclusive classrooms, because they lack knowledge and strategies needed to implement such programs effectively. In Tanzania, Mtuli (2015) revealed that teachers and students with hearing impairment in secondary school said that training and learning facilities were inadequate to the hearing impaired students and teachers were inadequately prepared to meet the new system of inclusive education system.

In Kenya, Kenya Sign Language (KSL) was adopted, in 2004, as a medium of instruction for learners with hearing impairment (HI) after various modes were tested out but failed to fulfil the communication needs of the learners (Ministry of Education Science and Technology, 2004). Muguna (2011) reported that most of the methods used in Kaaga School for the Deaf, Meru were either, sign language, total communication, dramatizing, use of exact English, visual aids, pantomime, role play, eye contact, lip reading, use of signed English and finally the use of gestures. This is a clear indication that the teachers in the school were knowledgeable in the application of the various teaching methods for performance. In Meru County, children with hearing impairments perform significantly poor in mathematics. This is evidenced by Kenya certificate of Primary Education results for children in special school and units since 2010. They attained the following mean scores in mathematics, in the year 2010, the mean score was 30.75, and mean score of 27.25 in 2012, a mean score of 29.30 in 2013 and a mean score of 29.1 in 2014.Therefore, there is an urgent need for the study to be conducted to address the impact of various teaching methods that are used/not used by the teachers that have impact on academic performance in mathematics in Igembe District.

1.1 Purpose of the Study

The purpose of this study was to teaching methods employed by teachers that have positive impact on academic performance of learners with hearing impairments in mathematics.

1.2 Conceptual Framework

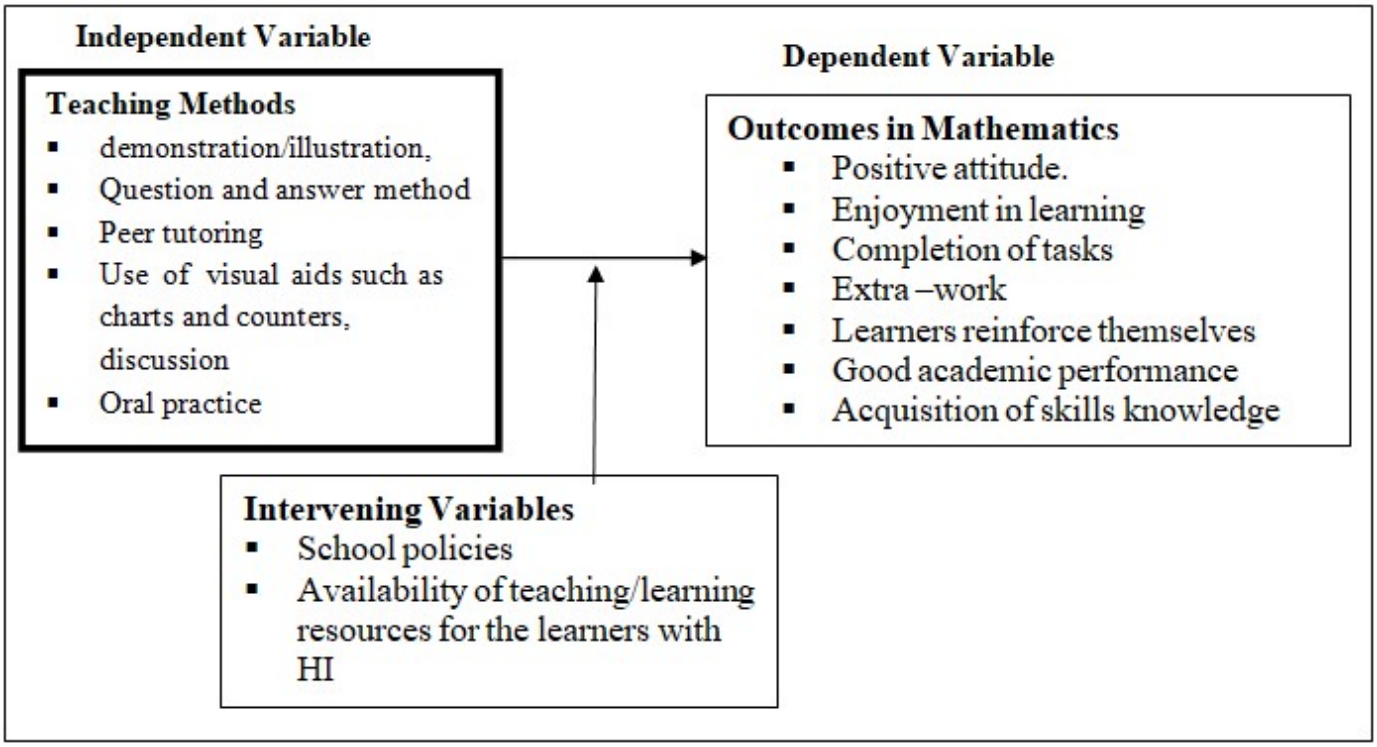

Figure 1: Conceptual Framework

II. LITERATURE REVIEW

2.1 Methods of Teaching Mathematics

Erbas (2017) sought to ascertain strategies that teachers use to support the inclusion of students who are deaf and hard of hearing. Per the research that was been carried out, it was concluded that the general education teachers attempted to support the inclusion of students who are DHH by employing various strategies including the use of workstations, multiple representations of information by including visual and technological aids in their instruction, the seating arrangement the seating arrangement, hard of hearing received support from assistive listening devices and use of personal microphone to support the students' assistive listening devices in the three classrooms.

Tanridiler, Uzuner, and Girgin, (2015) carried out a study on teaching and learning mathematics with hearing impaired students. The purpose of this action research was to analyze the teaching efforts of mathematics to seventh grade hearing-impaired students at the Education and Research Center for Hearing Impaired Children (ERCHIC). The data were collected via video recordings of the group and individual mathematical instructions; the audio recordings of the reflective meetings, lesson plans, exams, reflective diaries, data evaluation charts, and interviews; and the files related to the students' mathematics work in 2009–2010.

Swanwick, Oddy, and Roper (2005) study sought to explore the reasons for this persistent underachievement by focusing on results from the National Mathematics tests taken in the UK by all 14 year olds. The concluding analysis raises significant questions about deaf pupils' access to mathematics educational provision and more specifically about the deaf experience of mathematics learning and how they perceive themselves as mathematicians. Stewart and Kluwin (2001) established that early intervention for learners with hearing impairments in mathematics is very important. Mathematics concepts should be introduced alongside language and communication programmes. Many deaf and hearing impaired students lag behind in learning mathematics (Stewart & Kluwin, 2001; Traxler, 2000).

Deaf and hard-hearing individuals (who sign) have an advantage over hearing individuals in making math visual in the head and doing mental manipulations (Marschark, 2003). This strength makes origami particularly appropriate for students who are deaf and hard of hearing and might be especially motivating and socially useful and reinforcing. The researcher is interested in trying to find out if the teachers in Igembe combine variety of teaching to teach mathematics to learners with hearing impairments. It is worth noting that hearing impairments range from mild ,moderate ,moderate to severe, severe and profound, integrating play with mathematics makes this students develop interest in learning the subject this can be done by ensuring that students read loud this mathematical terminologies embedded in their play, The use of active learning, application of learning in real-life situations, and integration of learning with other topics will make them successfully achieve mathematics milestones, in turn making them achieve competency in mathematics.

III. METHODOLOGY

3.1 Research Design and Target Population

This study adopted a descriptive design. Descriptive design also known as statistical research and it describes phenomena as they exist. The descriptive survey design was appropriate for this study because it enabled the researcher to describe the effects of teaching methods on academic performance in mathematics among learners with hearing impairment in Meru County Kenya. It was also appropriate because the study did not manipulate any variable under study rather it sought to analyse the existing situation as it pertains the effects of teaching methods on academic performance in mathematics among learners with hearing impairment in Meru County Kenya. The target population for this study is Headteachers of special school/units, teachers teaching mathematics in special school/units, and quality assurance and standards officers in Igembe Districts, a total of 67.

3.2 Sampling Technique and Sample Size

For this study, purposive sampling technique was applied to select special school/units, Headteachers, and Educational Q.A.S.O's. A sample of 52% of accessible, population was purposively sampled for this study. That is 11 Headteachers, 23 teachers and 2 District Quality Assurance and Standard Officers (DQUASO). A total of 36 respondents were used for this study.

3.3 Research Instruments

The researcher used three (3) types of research instruments to collect data, that is, questionnaires, interview guide and observation schedules/checklists. The instruments were constructed to meet the objectives of the study.

3.4 Pilot Study

A pilot study was done in one special units of the neighboring Tigania District that is Kanjalu special unit in Kanjalu primary school to test the instruments if they were ambiguous or not and the unit was not included in the final study. Based on test-retest method, comparisons of the 1st and 2nd scores were made using Pearson's product moment correlation coefficient to determine the reliability index of the instrument. To test for validity, the instruments were developed with the consultation of fellow post graduate students and supervisors. Pilot study was carried out to check the appropriateness of the language in the instruments as per research objectives in chapter one. The researcher ensured that all the contents of the objectives /research questions are covered by the instruments.

3.5 Data Collection Procedure

After approval of the research proposal, the researcher obtained an introduction letter from Kenyatta University. The researcher then used the letter to obtain a research permit from National Commission for Science Technology and Innovation. Prior to the main study, **a**ppointments were made with head teachers of the schools. The researcher then visited schools with learners with hearing impairment to establish rapport with the targeted respondents before the actual data collection. The respondents were assured of confidentiality and asked not to write their names on the questionnaires. The researcher personally administered the research instruments to the sampled respondents.

3.6 Data Processing and Analysis

After data collection, the researcher systematically arranged the interview and questionnaire transcripts and data to facilitate analysis and report writing. Quantitative data were then analysed by tallying the number of similar responses using descriptive statistics and specifically frequency counts, means as well as percentages. Results of the data analysed were presented using frequency texts. On the other hand, qualitative field data were analysed by grouping the kind of similar responses given according to specific themes generated from the objectives of the study and presenting them in spoken or written form.

IV. STUDY RESULTS

This section presents the data collected from the field and its analysis based on the achievement of the study purpose which sought to find out teaching methods employed by teachers that have positive impact on academic performance of learners with hearing impairments in mathematics. Teachers were requested to outline some of the teaching methods they use while teaching mathematics to learners with hearing impairment. The results indicated that teachers employ a variety of methods such as demonstration/illustration, question and answer method, peer tutoring, developing concepts in steps from simple to complex, use of many visual aids such as charts and counters, discussion, oral practice based on addition, subtraction, multiplication and division facts, group work where pupils with different levels of competency are grouped together to uplift one another, teach test where learners are given exercises to work on to gauge their competence and task analysis.

The results from teachers corroborates information gathered from head teachers who indicated that demonstration, use of real objects, approach and attach response and explaining key words/items in advance as some of the teaching methods employed to teach mathematics to learners with hearing impairment. The use of teach test as a method of enhancing learning of mathematics supports the finding of Morgan (1998) which indicated that the use of routine practice is the strongest educational practice that teacher can use in their classrooms to promote achievements in mathematics. The findings also supports MOEST (2001) which argues that teachers should employ an important strategy which is to create an environment in which students are engaged in practical activities from which mathematics can be learnt in an interesting and meaningful way.

The finding that use of many visual aids such as charts and counters impact on performance in mathematics corroborates Herold (2008) findings which indicated that engaging varied and meaningful interaction that incorporate basic mathematics concepts such as number counting, quantity, time/sequence and categorization into day-to-day routine enhances performance in mathematics. This implies that teachers strive to ensure that all learners learn mathematics effectively. This is based on Morgan (1998) argument that the use of a combination of teaching methods, that is, the use of hands-on-materials and the use of traditional methods, ensure that both struggling learners and brighter students learn mathematics effectively. The finding also support Ansell and Paglioro, (2008) research finding that problems in mathematics requires more than, simply using the correct operation. Unlike teachers and head teachers, QASOs indicated that teachers only employ teacher centered approach to teach mathematics to learners with hearing impairment.

V. CONCLUSION

It can be concluded that teachers employ a variety of methods such as demonstration/illustration, question and answer method, peer tutoring, developing concepts in steps from simple to complex, use of many visual aids such as charts and counters, discussion, oral practice based on addition, subtraction, multiplication and division facts, group work where pupils with different levels of competency are grouped together to uplift one another, teach test where learners are given exercises to work on to gauge their competence and task analysis. It was also established that the use of a variety of methods enhances academic performance of learners with hearing impairment in mathematics.

VI. RECOMMENDATIONS

The study recommended that teachers should be employing varied teaching methods such as demonstration, participatory, educational technology and peer tutoring while teaching learners with hearing impairment in order to enhance their academic performance especially in mathematics. A study should be conducted on the impact of teaching methods on academic performance of learners with hearing impairment in other subjects other than mathematics.

REFERENCES

[1] Ansel,,D. and Pagliaro,C. (2008) .The relative difficulty of signed arithmetic story problem for primary level deaf and hard of hearing students -Messages posted unpublished.

[2] Govindan, N., & Ramaa, S. (2013). Analysis of errors made by children with hearing impairment. International Journal of Science and Research, 6(4), 2319-7064.

[3] Herold A. (2008, "What have we learned from research in Deaf education" –Michigan State University. Http: www.stert paragraph (3/6/2014)

[4] MoEST (Ministry of Education, Science and Technology) (2004). Sessional paper on a policy framework for education, training and research: Meeting the challenges of education, training and research in Kenya in the 21st century. Nairobi: Government

[5] Morgan, L. Paul (1998) –Education evaluation and policy analysis A peer reviewed journal of the American educational research association state university- U.S.

[6] Mtuli, T. C. (2015). Assessing the challenges of teaching and learning of hearing impaired students enrolled in regular primary and secondary schools (Doctoral dissertation, The Open University Of Tanzania).

[7] Parvez, K., Khan, M., Iqbal, J., Tahir, M., Alghamdi, A., Alqarni, M., & Javaid, N. (2019). Measuring Effectiveness of Mobile Application in Learning Basic Mathematical Concepts Using Sign Language. Sustainability, 11(11), 3064.

[8] Shelton, B. E., & Parlin, M. A. (2016). Teaching math to Deaf/hard-of-hearing (DHH) children using mobile games: Outcomes with student and teacher perspectives. International Journal of Mobile and Blended Learning (IJMBL), 8(1), 1-17.

[9] Stewart, D. A., & Kluwin, T. N. (2001). Teaching deaf and hard of hearing students: Content, strategies, and curriculum. Boston: Allyn & Bacon.

[10] Tanridiler, A., Uzuner, Y., & Girgin, U. (2015). Teaching and learning mathematics with hearing impaired students. The Anthropologist, 22(2), 237-248.

[11] Traxler, C. B. (2000). Measuring up to performance standards in reading and mathematics: Achievement of selected deaf and hard-of-hearing students in the national norming of the 9th Edition Stanford Achievement Test. Journal of Deaf Studies and Deaf Education, 5(4), 337-348.

[12] UNESCO (2010). Early Childhood Care and Education Regional Report: Africa. Dakar, UNESCO-BREDA.

[13] UNESCO, (2000). The Dakar Framework for Action: Education for All — Meeting our Collective Commitments (Including Six Regional Frameworks for Action). Adopted by the World Education Forum. Dakar, 26–28 April 2000, UNESCO.