

# INFLUENCE OF TEACHER FACTORS ON MATHEMATICS PERFORMANCE AMONG LEARNERS WITH HEARING IMPAIRMENT IN SPECIAL SECONDARY SCHOOLS

<sup>1</sup>OWIKO CLEOPHAS OWINO, <sup>2</sup>DR OMOKE CHARLES, <sup>3</sup>DR MWEBI BENARD

<sup>1,2,3</sup> JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

---

**Abstract:** The purpose of the study was to explore the influence of teacher factors on mathematics performance among learners with hearing impairment in special secondary schools. The study was based on Vygotsky's Zone of Proximal Development Theory and a Conceptual framework. The multiple case study research design was adopted in the study. The study was conducted in three secondary schools for the hearing impaired in the lake region (formerly Nyanza Province) in Kenya. The target population was 54 respondents that comprised of 3 principals, 12 Mathematics teachers, 9 Curriculum Support Officers 6 Parents representatives and 24 form 3 students. The study sample size was 47 respondents that comprised of 3 principals, 8 Mathematics teachers, 6 Curriculum Support Officers students, 6 Parents Teachers Association representatives and 24 form 3 students. Saturated, stratified and purposive sampling techniques were employed to pick out the sample. The research tools were interviews, observation, document analysis and Focus Group Discussion. The researcher collaborated and consulted with his supervisors and other expert lecturers in the school of education to validate the instruments. Trustworthiness of qualitative data was ensured using triangulation, thick description and member checking strategies. The qualitative data collected was analyzed using thematic analysis. On the concern about teacher factors influencing mathematics performance, the themes on teacher factors that emerged were: few mathematics teachers, gender of the teacher, teachers' personality, age of the teacher, teacher competence, teachers' professional experience, teachers' knowledge and use of sign language, few teacher-learner consultations, teachers' mode of delivery and inadequate teacher refresher courses. The study concluded that the themes on teacher factor were paramount in influencing mathematics performance among learners with hearing impairment. It was recommended that the government to staff special secondary schools for the deaf with teachers who are qualified in deaf education so as to improve performance in subjects like mathematics. A study on the influence of the degree of hearing impairment would expound the understanding of the current study.

**Keywords:** Learners with hearing impairment, Mathematics performance, Teacher factors, Teaching and Learning resources, Special secondary schools.

---

## 1. INTRODUCTION

### 1.1 Background to the study:

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. Knowing mathematics well actually means having mathematical knowledge. Mathematical knowledge is a combination of information used in counting, calculating, solving routine mathematical problems, or conducting mathematical related findings (Tanridiler et. al, 2015).

## International Journal of Novel Research in Education and Learning

Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

Studies show that children with hearing-impairment can learn mathematics just as their hearing peers but at a delayed pace (Traxler, 2000 & Tanridiler, 2015). On the other hand studies show that, principle and elements of balanced mathematics instruction (BMI) are important for students with hearing impairment (Stewart & Kluwin, 2001; Nunes & Moreno, 2002; Pagliaro, 2006). It can be argued that, by adopting such principles all children are capable of learning and performing mathematics problems.

Possible ways and means in learning mathematics must be sought at all levels of education. This is because it is core in scientific, technological development and research. The Vision (2030) well spells it out that Kenya is aiming to be a regional centre of research and development in new technologies. Children with special needs especially, those with hearing impairment, need to be encouraged in the learning of such a subject like mathematics. This is through offering them the opportunities to do so. Such opportunities include for example; problem based learning, that is, what kind of mathematics problems help students develop deep, conceptual understanding (MacMath, Wallace & Chi-2009), encouraging cognition and self-interest in solving problems (Blanco, Barona & Carrasco, 2013), teachers role in learning the subject-mathematics by the students (Shore & McNeil; 2014), improving basic mathematics instructions through technology resources (Murray, Pacuilla and Helsel; 2007), the use of semantics in improving performance in mathematics (ACARA, 2005), which directly reflects on linguistic variables.

The position of mathematics in education cannot be underestimated. Globally, most countries give special attention to the teaching and learning of mathematics. It is taken as an opener to employment and technological advancement (Murray *et.al.* 2001). Internationally, mathematics has been considered as a top priority subject together with reading. It is argued that mathematics is the foundation for success in a variety of content areas during a child's educational experience. In addition it is reported that Mathematics is the path towards the wider job market (Londonderry School District, 2007). The report states that students who take a rigorous K-12 mathematics sequence are more likely to go to college than those who do not. In the job market, the report further states that students who have strong mathematics background are more likely to be employed and earn 38% more per hour than those with insufficient skills in algebra, geometry, measurement, and probability.

Mathematics is crucial not only for a person's success in school, but also in being an informed citizen, being productive in one's chosen career, and in personal fulfillment. In today's technology driven society, greater demands have been placed on individuals to interpret and use mathematics to make sense of information and complex situations. As a result, the Londonderry School District (2007) in England, places the understanding, application of numbers and operations, algebra, geometry, measurement, data analysis, problem-solving, and reasoning skills as top priorities, all of which being the subsets of mathematics.

In reference to learners with hearing impairment, the issue of difficulties involved in mathematics has been studied by various scholars who have given reports on their poor performance. Scholars like Maxon and Brackets (1986) conducted a comparative study in USA as to whether deaf children and their hearing counterparts performed the same in mathematics. They detected low performance in mathematics by children with hearing impairment as compared to their regular counterparts. They argued that this was not due to cognitive difference but eluded this to linguistic deficit. Moores, (2000) in USA and Foisack, (2003) in Hongkong both conducted their studies comparing the performance of deaf students and the hearing peers in mathematics. The studies also indicated that deaf students achieved much lower results on tests in mathematics than hearing students do; an indication of difficulties experienced by the students with HI in learning and performing mathematics.

### 1.2 Statement of the problem:

Consistent low performance of learners with hearing impairment in mathematics is a worrying phenomenon in the education compared to the regular learners. A study on the influence of teacher factors on mathematics performance among learners with hearing impairment in special secondary schools was undertaken with a view of identifying the causes of such dismal results.

### 1.3 Purpose of the study:

The purpose of this study was to explore the influence of teacher factors on mathematics performance among learners with hearing impairment in special secondary schools.

#### 1.4 Objectives of the study:

The objective of the study was to establish the influence of teacher factors on mathematics performance among learners with hearing impairment in special secondary schools.

#### 1.5 Research questions:

The following research question that guided the study was: How do teacher factors influence mathematics performance among learners with hearing impairment in special secondary schools? **1.6 Significance of the study.**

The study might be useful to Teachers Service Commission, Kenya Institute for Curriculum Development (KICD), the students with hearing impairment and mathematics teachers.

#### 1.6 Scope of the study:

The study concentrated in explored the influence of teacher factors on mathematics performance among learners with hearing impairment in special secondary schools. The study was conducted only in special secondary schools for the deaf in selected counties in the western region (Siaya, Kisii and Migori), Kenya.

#### 1.7 Theoretical framework:

This study employed Vygotsky's Zone of Proximal Development (ZPD) to guide this study. The theory, if applied in teaching mathematics, might induce the teachers to applying appropriate pedagogical strategies as to improve the performance in the subject among the children with hearing-impairment. Teaching mathematics in the child's zone of proximal development (Christmas, Kudzai and Josiah, 2012) is viewed as one way of improving performance in mathematics. Through this theory, the learning is mediated and scaffolded by the teacher, expert adult or knowledgeable peer; making it more meaningful, easier, manageable, effective and efficient. But as there are individual differences among the learners, it becomes difficult (challenging) for teachers to identify every learner's zone of proximal development. Christmas *et.al* (2012), remark that despite this limitation or challenge, the ZPD, if appropriately applied could improve mathematics teaching and learning in the schools. The significance of the ZPD is that it enables penetration into the causal-dynamic and genetic connections determining the process of mental development (Chaiklin, 2003; Obhukova and Korepanova, 2009).

## 2. LITERATURE REVIEW

### **Influence of teacher factors on performance in mathematics by learners with hearing-impairment in secondary schools:**

Wallace and Chi (2009) give a continuum of activities using problem based learning (PBL) to diagnose student misconceptions in learning. This approach relates to Vygotsky's theory of the zone of proximal development that emphasizes on collaboration and consultation among the teachers, learners and parents in order to enhance the performance of the learners in the subjects like mathematics (Vygotsky, 1978). It was seen relevant to test such arguments in this work and affirm if the approach could lead to enhancing the performance of the hearing impaired learners in mathematics.

Hsin-Ling (2009) study examined issues regarding inclusion of students who are deaf or hard of hearing from the nondisabled students' viewpoint. He explored various factors related to interpersonal and/or intergroup contact between nondisabled students and students who are deaf or hard of hearing. A correlation research design was applied. Purposive sampling approach was employed to recruit participants with the specific predefined characteristics under study. Both nondisabled students and their peers who are deaf or hard of hearing in secondary schools in the research residential area were targeted for participation.

Al-Agil, Bin Mamat, Abdullah & Maad (2012), view Mathematics as a core subject area in the current world of technology. They explain that mathematics serves physics, chemistry, biology, economics, and other branches of science. It means that for a student to master these courses (physics, chemistry, biology, economics etc) he/she must be well equipped and familiar with mathematics. Mathematics is considered as the backbone of any scientific undertaking, which the students should master prior to their foundation in any scientific endeavors. Under such context, the teacher is taken to

## International Journal of Novel Research in Education and Learning

Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

play a pivotal role in the learner's performance in the field and/or subject area. It is the teacher to provide the learners with opportunity, skill areas and conceptualization processes necessary to enhance their learning and developing interests towards mathematics for higher performance.

Al-Agil *et.al* (2012) argue that with the element of time, the teacher has also to offer a good measure of time exposed to a learning situation. This is to lead to effective content coverage, hence, better academic performance. The element of time has also been echoed by Berliner (1990), who explained time in different perspectives with reference to effective learning-an area that the teacher should sensor very well in school. Some of the teacher factors influencing the learners' performance in mathematics include the teacher's experience in teaching mathematics, teacher's motivational skills and the availability of qualified experienced teachers in the school. These are pivotal to students' high performance in a subject like mathematics (Al-Agil, et, al 2012). Poor or bad teaching practices (methods) therefore lead to gross failure in a subject.

Jerry – Shore and Mcneil (2004) remark that if there is not a good relationship present between the teacher and students then learning is less likely to occur. Students, both young and old, need to feel safe in their learning surrounding. They believe that their teacher is fully interested in knowing each individual they will be working with. This will include; understanding where the student is coming from, what they know, what they want to know and what they do not know.

Students with disabilities perform poorly in math compared to their non-disabled peers (McDonnall *et.al.*, 2010). McDonnall *et.al.* (2010) provided one example of the gap in math achievement between students with disabilities and their non-disabled peers. They found in the 2007-2008 school year, 56% of students with visual impairment scored at or above grade level in

Maths as compared to 74% of their non-disabled peers (McDonnall *et.al.*, 2010). This deficit in maths skills can affect not only an individual student's future earning capabilities but overall 13% society's competitiveness (Wei, Lenz, & Blackorby, 2012). When students do not achieve academically in maths, it affects not only the individual student, but also the society as a whole. In order to gain access into middle class jobs, an individual must have the ability to do maths on at least the nth grade level (Lerman, 2013). He also stated that higher mathematics skills are positively correlated with higher earnings.

Al-Agil, *et.al* (2012) Adeogun and Osifila (2008), apart from the teachers' teaching experience, emphasize the interaction of the teachers and the students that results in effective instructional practices. They give the students more time exposure to the subject content, in this case, mathematics content is well covered. Stevenson, Lees' and Stigler, (1986) quoted by Al Agil *et.al.*, (2012) argue that, when students are exposed to rigorous mathematics contents, the learning is increased. The current study was to confirm whether such reports were true or not.

Musonda and Phiri (2017) study sought to examine emerging factors affecting the academic performance of deaf and hard of hearing learners at Chileshe Chepela Wansongo Special Secondary School, Kasama, Zambia. A case study research design was employed in order to have an in-depth understanding of the problem under investigation. Qualitative and quantitative research methods were utilized in the collection and analysis of data. The sample was 30 distributed as follows: 12 teachers, 2 school managers, 15 HI learners from the special secondary school and 1 Education Standards Officer in charge of Special Education in Kasama district, Northern Province of Zambia. The results of the study revealed that teachers of learners with HI had limited skills in the appropriate mode of communication and so the teaching and learning processes were negatively affected. This led to poor performance of the learners in the final examination.

Adeogun and Mtuli (2016) conducted a study which aimed at examining the challenges of teaching and learning to students with hearing impairment. They also examined factors contributing to poor academic performance of hearing impaired students enrolled in regular secondary schools. They used a case study design where the research tools used were interviews and observation in order to evaluate the challenges of teaching and learning of hearing impaired students enrolled in regular primary and secondary schools. They also studied teachers of special education, heads of schools and the District Education Officer for special education in the area. From the respondents' point of views, teachers' incompetence in sign language led to the hearing impaired student's failure to understand the instruction in the class. In line with that case, they depended on asking other students of what the topic was all about and what was needed by the teachers. Some ordinary students however had low skills and knowledge, in that case, failed to help them and sometimes misled them if they were to learn from other learners.

Osifila (2008), in Nigeria also support the fact that teacher's attributions and instructional qualities like teaching methods are the most important factors influencing the students' learning of mathematics, hence, performance in the subject either positively or negatively. The current study is on how learners with hearing-impairment can have good performance in mathematics. The practice of teaching is crucial to the communication of values, skills and concepts by the teachers, the proceeds of classroom management and in enhancing students' learning. Teachers' characteristics, like their experience and behaviors in the classroom contribute to conducive educational environment for the students to learn. This would in turn, have an impact on their academic achievement.

Adeyinka *et.al* (2013) explain that well trained and motivated teachers in mathematics, if well deployed to the secondary schools, will bring about well rounded students who will perform academically high in mathematics. Most teachers are trained and have clear goals to guide their teaching, but good motivation for the teachers together with teaching and learning materials seem to be inadequate. There is also gross understaffing of special secondary schools with trained and qualified mathematics teachers. As a result, there has been a public outcry about poor performance in mathematics at secondary school level, especially in the special secondary schools for students with hearing impairment (Maina *et.al*, 2011).

Mbugua *et.al* (2012) study was to determine the school based factors that affect students' performance in Mathematics in secondary schools: From their study, the factors contributing to poor performance include under staffing, inadequate teaching and learning materials, lack of motivation and poor attitudes by both teachers and students towards the subject and retrogressive practices.

### 3. RESEARCH METHODOLOGY

#### 3.1 Research Design:

The study employed a multiple case study research design to conduct investigations in this study. A case study method enables a researcher to closely examine the data within a specific context (case). In most cases a case study design selects small geographical areas or a very limited number of individuals as the subjects of the study (Zainal, 2007). Case studies distinguish themselves from experiments especially in control. A true case study requires the researcher to study a phenomenon without affecting the study subject at all. In this study the performance in mathematics by learners with hearing impairment was investigated from three cases, that is, the three special secondary schools for the deaf in Nyanza region.

#### 3.2 Location of the Study:

The study was carried out in Western Kenya and covered three counties-Kisii, Siaya and Migori Counties.

#### 3.3 Target Population:

The target population was 54 respondents that comprised of 3 principals, 12 Mathematics teachers, 9 Curriculum Support Officers 6 Parents representatives and 24 form 3 students.

#### 3.4 Sample size, Sample and sampling techniques:

The study sample size was 47 respondents that comprised of 3 principals, 8 Mathematics teachers, 6 Curriculum Support Officers students, 6 Parents Teachers Association representatives and 24 form 3 students. Saturated, stratified and purposive sampling techniques were employed to pick out the sample.

#### 3.5 Research Instruments:

The study employed interview schedules, observation checklist, focus group discussion guide and document analysis guide to collect data.

#### 3.6 Trustworthiness of qualitative data:

Validity and reliability of qualitative data was ascertained through Lincoln and Guba (1985) qualitative paradigm: Credibility; Transferability; dependability; and conformability.

### 3.7 Data Analysis:

The data were reflectively analyzed starting from the time they were collected while still in the field (Creswell, 2009; Gall *et. al.*, 2007; Maxwell, 2005). This enabled the researcher to discover important sources and information that were overlooked in the design. This was achieved in three ways: First, by having consultative meetings or sessions with the respondents (interviews) and consultations with supervisors. Second, it was by having field note summaries together with a voice recording garget. Third, it was by having data summary sheets (Drew, Hardman & Hosp, 2008). The recorded interviews were transcribed, while the memos, records, reports and notes were read and analyzed. Field notes were analyzed and interpreted in readiness for coding in relation to the answers of the structured questions.

### 3.8 Ethical Considerations:

The ethics of research were upheld by researcher such as accessibility and acceptability, protecting participants from harm, obtaining informed consent of participants, anonymity and confidentiality and respecting the privacy of participants.

## 4. RESULTS AND DISCUSSION

### Teacher factors influencing performance in mathematics among the deaf learners:

The study also investigated teacher factors influencing performance in mathematics among the deaf learners, the themes that emerged were: Gender of the teacher, Teachers' personality, Age of the teacher, Teacher competence, Teachers' Professional experience, Few Mathematics teachers, Teachers' Efficacy, Teacher attitudes, Teachers' knowledge of sign language, few teacher-learner consultations, and Teachers' mode of delivery and Inadequate Teacher Refresher courses. Most study respondents reported that there were several teacher factors which influenced the mathematics performance among the hearing impaired learners.

#### Gender of the teacher:

During the focus group discussion, a student stated that female teachers tend to be absent most of the time—"like now she has not been there many weeks". During observation in class in another study school, a BOM teacher was in for a female teacher who was on a maternity leave. Still, the student posed some worries, to them even maternity leave was not comparable to their being taught. It means, such students had developed negative attitudes towards a teacher because of gender commitments. Some excerpts regarding the influences of gender are:

*well.....Most learners who are deaf do not take female teachers seriously when in class and thus look down upon them and this has made them have negative attitude towards mathematics when they are being taught by a lady teacher.(Maths teacher,1)*

*Deaf learners have more respect for male teachers as compared to the female ones and this affects how they get committed to studying mathematics. It's an issue of gender preference which can be cultural in nature" (CSO, 2)*

*mmmhh..... I have seen the deaf learners are more receptive to male teachers as compared to the female teachers. . The learners feel that maths is meant for male teachers only. They don't take female teachers seriously when in class and this has affected achievement in maths classes(PTA Rep, 3)*

*.....at times we come in to instill discipline orderliness so that they behave well during maths lesson by female teachers newly recruited.....(Principal 3).*

From the excerpts above it can be concluded that deaf learners considered the gender of the teachers when being taught. This eventually affected their achievement in mathematics negatively. The fact that they looked down upon the female teachers made them have negative attitude towards them and thus were not receptive during the mathematics lessons- quotation from principal 3 justifies this. In agreement, Escardibul & Mora (2013) in their study found out that that all pupils who studied mathematics with a female teacher obtained higher results on the blind-test than those with a male teacher. Owolabi & Adebayo (2012) in their study revealed that teacher's gender has no effect on their ability to impact knowledge on the students, as long as he/she is a skilled teacher in that field of study. The two studies are not in line with the current study. However, the current study is in concurrence with the findings of Akiri & Ugborugbo (2008) which revealed that there was a significant relationship between the teacher's gender and the student's academic achievement. In

a similar direction, Okoro, Ekanem & Udoh (2012) found that teacher pupil gender interactions do significantly affect pupil's academic performance. The finding of this study revealed that, students with hearing impairment were more positive to a male teacher teaching them mathematics rather than a female teacher. It therefore means that, male teachers could lead them to achieve higher in mathematics than the female teachers.

### Teachers' personality:

Most participants reported that the teachers who were strict, assertive and more focused enhanced mathematics performance among deaf learners while those who were less assertive, less strict and/or lazy impacted negatively on mathematics achievement among the deaf learners. In the group discussion, a student (Student 4 FGD 1) claimed that some teachers were not in, in marking work done and they could not know whether the answers were wrong or right. This was an indication of lack of assertiveness and strictness, thus, lack of personality. Some respondents reported that:

*Mathematics is generally not an issue in school to deaf learners but the teacher's personality really matters. The teachers who are very assertive will demand more from learners and this will make them perform better in mathematics. Other teachers who are lazy and are not strict make learners relax therefore fail in mathematics and because of that I must always supervise their work (Maths Teacher, 2).*

*Yes.....a subject depends on the teachers own skills that would make learners either work hard or be lazy. More follow ups leads to better results in mathematics (Principal 1).*

*I have seen maths performance differs from teacher to teacher. Some teachers have the character that follows up learners frequently and this makes them to improve in mathematics performance. Other teachers aren't strict with learners' work and as such the results end up being bad (PTA Rep, 5).*

From the excerpts above, it can be concluded that mathematics as a subject is not a problem but the teachers' personality affects the output of deaf learners to it. There are differences in the teacher personalities which eventually affect the performance in mathematics.

Studies by Chowdhury and Gosling (2008) reported that organization, carefulness, discipline, goal setting and high level of diligence by teachers led to high performance among their students as compared to their less conscientious counterparts. In a similar note, Chamoro-Premuzic & Furnham, (2003) stated that conscientious employees are more reliable, hard working and generally perform better than those scoring low on this trait.

### Age of the teacher:

The respondents reported that learners tended to respect older teachers and they took them seriously but they underrated young teachers whom they saw to be just of their age. Some respondents reported that:

*Age matters to learners who are deaf. They see older teachers to be having more wisdom as compared to younger teachers whom they look down upon. This will affect the mathematics performance among the deaf learners depending on the age of the teacher handling the subject. (CSO, 3)*

*I have seen deaf learners tend to give more respect to older teachers but they look down upon the younger ones. Their reception to older teachers is good and this would affect their attitudes towards mathematics (Principal, 2)*

*"as they say, "old is gold", most deaf learners give more attention to the older teachers and are more keen to their teaching/instructions as compared to the younger teachers. This attitude was found to be affecting the performance of learners with deafness in mathematics" (Maths Teacher 4)*

*"I like our old teacher, to teach us mathematics instead of this new teacher...Young like us" (FGD 3 Student 5).*

From the interview excerpts above, it has been concluded from the reports that old age or long service was associated with more wisdom and the deaf learners tended to like such teachers more as compared to the young ones who were seen to be of less importance. This affected performance in mathematics among the deaf learners. .Joan & Henry (2015) in their study revealed that students taught by teacher between the ages of 21 and 34 years achieved a higher score than those of 49 years and about, while students taught by teachers between the ages of 36-48 years achieved a higher score than then those of 21-34 years and 49 years and above.

### Teacher competence:

Most study participants were of the opinion that teacher competence greatly influenced performance in mathematics as the learners would finish the syllabus early and do lots of revision before learners take their examinations. Some teachers were reported to be more skilled and competent in content delivery as compared to others and this affected mathematics performance. Some excerpts regarding the above theme are:

*Some teachers are detailed when they teach maths and this makes learners to do well in the subject, but some teachers give no details during teaching, and this leads to difficulties in solving problems set from the work already done(CSO,3)*

*There are many teachers but the skills among them are different as you can see. Some are more competent in handling mathematics as compared to others. Competent teachers bring better results as compared to incompetent ones (Principal, 2).*

“Teachers are trained...yes. But you see some are better than others in their delivery and this affects performance of deaf learners in mathematics” (PTA Rep, 6)

“I like our mathematics teacher, he comes always , teach us always and can explain more if me go and ask him. He know the subject” (Student 8 FGD 2).

From the interview excerpts above, it can be concluded that teacher competence is one of the factors that greatly affect performance of deaf learners in mathematics. More competent teachers know their learners and are able to get the best of the learners in class. They also give various examples when covering each and every topic, hence, subject content oriented.

The study undertaken by Muzenda (2013), Eggen & Kauchak (2001), Schacter & Thum (2004) and Starr (2002) also revealed high positive correlations between teacher’s competence and students’ academic achievements. The current study, also revealed that competency of a teacher, enhanced the performance of learners with hearing impairment in mathematics. Lack of competency of a teacher on the other side lowers this performance.

### Inadequate Teacher Refresher courses:

Document Analysis revealed that there were no proper records showing that mathematics teachers from the study schools had been sponsored by the schools to attend such seminars/workshops like SMASSE. Even the mathematics teachers, stated that they have not been sponsored for the same. This was evidenced by respondent’s responses from some participants as follows:

*“SMASSE training is there but few teachers do attend it. This has also affected the teaching methodologies of teachers used in schools. The teachers thus lack skills which they can use to teach maths well”(CSO, 2).*

*Our teachers have some training in SMASSE but it has not been adequate enough to make us realize changes in the maths performance. The teachers would have been well trained in such aspects for the school to realize improvement in mathematics. (Principal 1).*

“I have never attended such a workshop or seminar since I joined here...so they are being conducted!” (Maths Teacher 1).

“I don’t know if such courses are organized and conducted for teachers, may be, for regular secondary school teachers.” (Mathematics Teacher 2).

From the interview excerpts, it can be concluded that lack of training in teacher refresher courses like SMASSE, SEMASTE A etc, has affected the performance in mathematics among deaf learners. Teachers are thus not well equipped with current teaching techniques which help the learners enhance their skills in mathematics.

### Teachers’ Professional experience:

Some participants reported that teachers with more professional experience in teaching mathematics among deaf learners were able to produce better results as compared to the other teachers who had little or no experience at all. During class observation there were indications that the BOM teachers employed still had problems when teaching these deaf children. Some participants reported that:



## International Journal of Novel Research in Education and Learning

Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

*“Well....as it’s said, experience is the best teacher. So, teachers with more experience, do better in mathematics since they know already the tricks in the syllabus. Such teachers are able to mentor learners very well to perform better as compared to the other teachers who have little experience in teaching” (Maths teacher, 5)*

*When a class is being taught by an experienced teacher, then deaf learners gain more, hence they are likely to perform better in the subject such as mathematics. Low experience makes teachers not even to be able to know which part of the syllabus is easier or difficult to handle during examinations. We therefore need more experienced teachers on this area. (Principal, 3)*

*I have seen teachers who are more experienced are able to give better mean scores in mathematics since they already know how each topic is handled well to ensure that learners are able to grasp the content appropriately. (CSO,2).*

The interview experts reveals that professional experience of the teachers is very crucial in enhancing mathematics performance among the deaf learners.

Ewetan & Ewetan in their study revealed that teacher’s years of experience is a measure of quality and thus becomes imperative in the achievement of students’ academic performance. This supports those who advocate that experienced teachers need to be retained in schools if higher productivity is to be achieved because learners achieve more from these teachers. This study is in concurrence with the works of Sweeney (1989) and Jones (1987)

### **Few Mathematics teachers:**

The findings from document analysis (Principals’ offices) indicated few mathematics qualified specialist teachers in the study schools. Some schools had one qualified specialist teachers, some had two .The rest were BOM teachers. In this regard, the professional qualification effect from teachers as low. From classroom observation, most of these BOM teachers either lacked professional records or skills of content delivery to the students. The appropriate methods of teaching (Maina *et.al* 2011) were not applied-a factor that was deemed to lower performance of learners in this subject. Some respondents stated that:

*We have few maths teachers in the schools. You see in this school, we are only two, but we have many lessons to attend to. I don’t even have time to mark many assignments given to the learners, and the performance in mathematics has not improved much due to that. (Maths Teacher, 5)*

*We have a problem in maths because of few teachers in our school. The maths teachers have a high workload and this has affected their quality of performance in mathematics. Teaching mathematics to these students is very difficult and we wish TSC give us enough qualified man power. (Principal, 2).*

From the interview excerpts, it can be concluded that the great shortage of maths teachers in the special secondary schools has lowered the performance in mathematics. The maths teachers have high work load which has hindered their effectiveness in teaching and doing revision in mathematics. The untrained teachers who have been employed to teach maths even lower the quality of performance also. Gwambombo (2013) in his study reported that the increase crisis in teachers’ workload allocation to science teachers was identified as consequences to the poor academic results among students in secondary schools in Tanzania.

### **Teachers’ Efficacy:**

During focus group discussion, some student’s complained At times the responses that followed were not relevant to the questions asked – an element of doubts as per the answer. This could arise either due to incompetence in language of communication or lack of content knowledge and this is related to efficacy. Some participants reported that:

*Some teachers see themselves as incapable of teaching mathematics and this negatively affects performance in mathematics. Others see themselves positively and this has led to high mathematics achievement among deaf learners (Maths Teacher 1)*

*The way a teacher sees himself or herself determines the efforts they will put while teaching mathematics. Some see themselves positively while others are very low on the opinions of how they would perform in class, and may be due to lack of subject content or inefficiency in language of communication or both. (Principal, 2).*

From the excerpts, it can be argued that teacher efficacy has proved to be powerfully related to many meaningful educational outcomes such as teachers' persistence, enthusiasm, commitment and instructional behavior, as well as student outcomes such as achievement and motivation. In agreement, Gibson & Dembo (2015), maintained that teachers with a high sense of efficacy believe that unmotivated students can be taught, given the extra effort and appropriate techniques. In contrast, teachers with a low sense of instruction efficacy think that they can do little if students are poorly motivated, and the influence which teachers can exert on their students' intellectual development is severely limited by non-supportive or opposing influences from the home and the community in which the students live. In a similar perspective, Moran & Hoy (2001) posited that teacher self-efficacy is powerfully related to many meaningful educational outcomes. Such outcomes are like teacher persistence, enthusiasm, commitment and instructional behavior, as well as student outcomes such as motivation and achievement.

#### Teacher attitudes:

In other responses, during focus group discussion, some participants explained that some teachers never bothered to mark their mathematics exercises done; hence, they could not know whether they were wrong or right in the answers they had got. Also during class observation, some teachers remarked that these learners are very difficult to teach new concepts; examples given were transformation geometry, surds and problems in angles involving sine, cosines and tangents... Some respondents also reported:

*Some teachers say that they fear teaching mathematics to those with hearing impairment...that affects even how they teach it, and it lowers performance too of deaf learners in the subject. When learners also know that the teacher doesn't like mathematics or hates them, then you can imagine the difficult situation in the class. Everyone is lost. (Principal, 1)*

*Teachers with negative attitude towards maths may not do much in the classes to improve performance among the deaf learners. Some teachers tend to build confidence in learners and this in turn makes the learners to do better in mathematics.(CSO, 2)*

From the interview excerpts above, it can be reported that attitude of the teacher is a great determinant of performance in mathematics. Teachers with negative attitudes towards the deaf learners are not likely to enhance mathematics performance among these learners but teachers with positive attitudes are well able to make them perform in the subject both in class and at the final exams, that is, KCSE. In agreement, Omolara & Adebukola (2015) indicated in their research that, teachers are not always ready to teach their students. This revealed that the teachers were reluctant to teach their subject as expected of them. Krecie and Grmek (2005) explained this observation by quoting a second year pedagogy student who said it was important for an individual to choose the right profession especially if they would choose teaching. He further said that many did not know how demanding teaching profession is and so it could not be well carried out without real wish and interest. In likeness, to this, a teacher in schools for the deaf finds it difficult to handle subjects to these students due to many obstacles. It therefore results in negative attitudes to teaching mathematics to this cohort of learners. This was really indicated in the study schools in this current work.

#### Teachers' knowledge of sign language:

Some participants reported that some teachers were not very conversant with the Kenya sign language, yet they were posted to teach deaf learners. Some teachers had vast knowledge of sign language which made content delivery of mathematics content to be easy hence enhancing mathematics performance among deaf learners. During classroom observation, it was realized that some teachers were more dependent on spoken language and the use of writing on the chalk board rather than the use of signs. This was clear indication that such teachers were still not very conversant with KSL in classroom. Further to that, in group discussions in the FGD 2, student 8 suggested that the teacher was too slow explaining ideas when using sign language. Within a period, very little content was covered. He further explained that in topics where demonstration and discussions were used, then the content coverage was faster. Some respondents reported that:

*Some teachers are not well conversant with the sign language and they have several challenges when teaching mathematics in classes for the deaf. This makes schools to only record grade Ds in mathematics (CSO, 3)*

## International Journal of Novel Research in Education and Learning

Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

“Well, the problem is the breakdown in communication between the deaf learners and their teacher if the teacher has difficulties in the mode of communication.” (PTA Rep, 4)

*There is always breakdown in communication during lessons in instances where the teacher is not very competent in the use of sign language or in instances where certain concepts and/or symbols lacked related signs. This makes learners who are deaf not to understand the content well since the delivery is poor due to the said lapse. (Maths teacher, 1)*

*when we are using BOM teachers to teach subjects like mathematics, we are very much worried because some of them are not conversant with sign language nor with the application of total communication (TC). This forces us to attach them to the old teachers in the school to coach them in the use of KSL and TC in their mathematics classes-language issues very important. (Principal 2)*

From the interview excerpts above, it was revealed that the knowledge of Kenya sign language is a crucial factor that may influence mathematics achievement among deaf learners in the schools. Little knowledge of the sign language always causes communication barrier between the learners and their teacher which in turn lowers mathematics performance in the subject at KCSE examinations. Similarly, Adoyo (1995) revealed that almost 95% of teachers were finding it difficult to use Simultaneous Communication effectively and there was confusion between Kenyan Sign Language (K.S.L), Total Communication (TC) and Simultaneous Communication (SC) as teachers didn't know the difference among them. Adoyo (2004) and Ochwal (2008) further found out that the Simultaneous Communication used by teachers was characterized by omissions, mismatches and distortion of information. These shortcomings had a great impact on what is communicated to the learners leading to communication difficulties such as distortion of the message, unintelligibility and no message, thus lowering the performance.

The findings of this study ascertained the fact that, the mismatch of communication between the teachers and the learners was a contributing factor to poor performance in maths by the deaf students. This was due to incompetence in the use of KSL to teach mathematics effectively. Even some teachers were complaining that most of the concepts, in mathematics were difficult to deliver or convey using KSL.

### **Few teacher-learner consultations:**

One of the main reasons supporting this was the fact that they were few and overloaded by work. In the process of document analysis, the researcher did not identify any such records pertaining to consultations. Evidence about this was lack of consultation cards which the teachers should be signing for students once they went to consult. During group discussions, students posited that they only met the teachers during class time. Asked if they had consultation cards, which the teachers could sign for them in the process, all of them responded negatively, that is, no such cards.

Some respondents reported that:

*We are so busy here, marking, teaching and doing several things and we lack time for such individual attention with each and every deaf learner. It's not easy to individualized learning in our case. You can just see how busy we are now. (Maths Teacher, 1)*

*It's a challenge to do individualized teaching in our case. It would be good I know but the situation doesn't allow that. We are committed with many things here in school and do not have time for such after doing the general maths lesson with everybody in class. (Maths Teacher, 3)*

From the two interview results, it can be concluded that there was little teacher-learner consultations in mathematics and this has contributed to poor grades in mathematics. The teachers did not have time for individualized work after lessons and this was taken to be lowering the performance of these students in mathematics.

Vygotsky (1978) in his study had suggested consultation as a method in teaching and learning process. In his theory (ZPD) he emphasized that teacher pupil should consult with each other so that the academic performance of the pupils would increase. In the process of consultation, the teacher assist the student to move from what he/she know and can perform without assistance to reach and perform in the area which previously was beyond his /her level of performance. Vygostkys theory had been taken to guide this story through his emphasis on consultation. In this study therefore it was found that such a viable mode of learning was lacking in the study schools.

**Teachers' mode of delivery:**

Teachers mode of delivery refers to the activities of educating or instructing; activities that impart knowledge or skill during classroom instruction. This was with respect to whether the learning was teacher centered or learner centered. A teacher centered mode of delivery is where the teacher is actively involved in teaching while the learners are in a passive, receptive mode listening as the teacher teaches. A learner centered mode is where the focus is on the learner as learner, on improving student learning and success, rather than on the transmission of information. Some participants reported that teachers who used learner centered mode during maths lessons were well able to make learning interesting which in turn enhanced mathematics performance among deaf learners.. Focus group discussion, revealed that explanation was majorly being used by teachers. In the course of discussion the students complained of "too much explanation which became boring". Some participants reported that:

*"When the teaching is learner centered then the deaf learners are able to perform well in mathematics because the learning is individualized and personal attention is given by the teacher"(Maths Teacher, 3)*

*"Some teachers are very boring during mathematics lessons because they make the lesson teacher centered. This makes deaf learners to lose touch with the subject and eventually it leads to poor performance in mathematics" (Principal 3)*

*" ,,,maths performance depends on the approach that the teacher uses to teach. In most cases, I have seen that when the teacher uses learner centered methods, then it leads to positive results but when the strategy is teacher centered then it doesn't bring good results most teachers do rely on explanation too much (Principal, 2).*

From the interview excerpts above, it can be concluded that the teachers mode of delivery affects the learners interest and commitment in the subject and, hence, its performance. This finding agrees with Maina *et.al* (2011) in their study found that the most adequately used methods of teaching of mathematics in secondary schools for the deaf were question and answer, examples and peer teaching. They further stated that question and answer, peer teaching, examples and class discussion were the methods found best for teaching mathematics to deaf students. These approaches were considered appropriate in the teaching of mathematics (K.I.E, 2006; NCTM, 2000). In the current study, teachers were more relying on explanations. Other methods which they tried to use include, question and answer; demonstration drawing and the use of examples. This implies that there was much on teacher centered method than learner centered

## **5. SUMMARY, CONCLUSION AND RECOMMENDATIONS**

**5.1 Summary of Findings:**

The study also investigated teacher factors influencing performance in mathematics among the deaf learners, the themes that emerged were: Gender of the teacher, Teachers' personality, Age of the teacher, Teacher competence, Teachers' Professional experience, Few Mathematics teachers, Teachers' Efficacy, Teacher attitudes, Teachers' knowledge of sign language, Few teacher-learner consultations, Teachers' mode of delivery and Inadequate Teacher Refresher courses.

**5.2 Conclusion of the study:**

It was realized that teacher factors influenced performance in mathematics by learners with hearing impairment in special secondary school. The teacher who knows how to manipulate teaching learning resources, to enhance the performance in a subject like mathematics, the teacher makes up for consultation and collaboration with the parents and the learners in order to uplift the standard of performance in the subject in this case mathematics at secondary school education. Further it is the teacher, whose linguistic capability in this case is to use sign language and the application of TC could augur well to high level of performance by learners with hearing impairment in mathematics.

**5.3 Recommendations of the study:**

Special secondary schools with HI should be well staffed with qualified teachers trained in the area of hearing impairment; teachers in Special secondary school should undergo refresher courses in Sign language, teachers should ensure that possible concepts, formulae, methods and skills that can be acquired by the learners are effectively taught using sign language before learners are exposed to examination. In addition the teachers should be vast with Total Communication when teaching. Teacher pupil ratio in special secondary school should be reduced. The highest should be 1:12..

#### 5.4 Suggestions for further research:

- i) The influence of degree of hearing impairment on mathematics performance by learners who are hearing impaired.
- ii) The effect of the administrative time of the heads of institutions on performance in mathematics by the learners who are hearing impaired.
- iii) The influence of learners attitudes on the performance in a subject (Mathematics)

#### REFERENCES

- [1] Al- Agil, M.G.Z: Bin Mamat, M, Abdullah, L and Maad, H.A. (2012): *The factors Influencing Students' achievement in mathematics: A case for Libyan Students Kuala Lumpur*: IDOSI publication
- [2] Arroyo, I., Royer, J. M., & Woolf, B. P. (2011): *Using an Intelligent Tutor and Math Fluency Training to Improve Math Performance...* Journal of Artificial Intelligence in Education, 21, 1-18.
- [3] Aiken, L.R. (1972): *Language factor in learning mathematics*” In *Mathematics Education Report*, Columbus, Ohio: ERICS
- [4] Adler J, Setati M. (2001): *Between languages and discourses*: Code964 Educ. Res.
- [5] Braswell-Burris, P. (2010). *Factors Affecting the Educational and Personal Success of Deaf or Hard of Hearing Individuals*. Doctorate of Educational Leadership, San Diego State University.
- [6] Corredor, L., Olga Lucía, & Calderón, Dora Inés. (2010). Bilingualism of Colombian Deaf Children in the Teaching-Learning of Mathematics in the First Year of Elementary School. *Colombian Applied Linguistics Journal*, 12(2), 9-24. Retrieved December 11, 2017, from [http://www.scielo.org.co/scielo.php?script=sci\\_arttext&pid=S0123-46412010000200002&lng=en&tlng=en](http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0123-46412010000200002&lng=en&tlng=en).
- [7] Adeyemo A. R; Oladipupo A. & Omisore A.O (2013). *International Journal of Humanities and Social Science* *Invention: Teachers` Motivation on Students` Performance in Mathematics in Government Secondary Schools, Makurdi Lg. Area.*
- [8] Adeogun, A. A and Osifila G.I (2008): *Relationship between educational resources and students academic performance in Lagos state Nigeria, International journal of Educational management (IJEM)*, 5 &6:144-153
- [9] Bempechat, J, And H. Ginsburg 1989): *Underachievement & educational disadvantage: The home and school experience of at risk youth. at risk Youth. IOSR Journal of Research & Method in Education (IOSR - JRME)*
- [10] Barham, J. & Bishop, A. (1995): *Mathematics and the deaf child*”. In Durkin, K & Shire, B (Eds) *Language in mathematical education; Research and practice*. Philadelphia: Open University press
- [11] Becta, J. (2009). *An exploration of parent's engagement with their children's learning*. London, Metropolitan University.
- [12] Creswell, J.W & Plano, C.V.L. (2011) *Designing and Conducting Mixed Methods Research*. (2nd Edition) London: Sage
- [13] Cohen, L. Manion, L., & Morrison, K. (2007): *Research methods in education*. New York Routledge
- [14] Carrasco A.C., E.G. Barona, L. J. Blanco (1998): *Construction and management of an instrument for the assessment of affect towards mathematics*
- [15] Christmas, D, Kudzai, C, Josiah, M (2013): *Vygotsky's zone of proximal development theory :What are its implications for Mathematics Teaching.*
- [16] Daniels, H. (2001): *Vygotsky and Pedagogy*. NY: Routledge/Falmer.
- [17] Davis-Kean and Schnabel, K. U. (2004) :‘The impact of socio-economic characteristics on child outcomes: The mediating role of parents' beliefs and behaviors’. *Child Development*, Under review, in Feinstein, L.

**International Journal of Novel Research in Education and Learning**

 Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

- [18] Donato, R., (2000): *Socio-cultural contributions to understanding the foreign and second language classroom*. In: Lantolf, J. P., ed. *Socio-cultural theory and second language learning*. Oxford University Press, 27-50
- [19] de Apodaca, R., Dana G. Gentling, Joanna K. Steinhaus, and Elena A. Rosenberg (2015). Parental Involvement as a Mediator of Academic Performance Among Special Education Middle School Students. *School Community Journal*, 2015, Vol. 25, No. 2 Available at <http://www.schoolcommunitynetwork.org/SCJ.aspx>
- [20] de Apodaca, R., Dana G. Gentling, Joanna K. Steinhaus, and Elena A. Rosenberg (2015). Parental Involvement as a Mediator of Academic Performance Among Special Education Middle School Students. *School Community Journal*, 2015, Vol. 25, No. 2 Available at <http://www.schoolcommunitynetwork.org/SCJ.aspx>
- [21] Durkin & Shire, B (1995): *ambiguity in mathematical context*. Philadelphia Open University Press
- [22] Ezema, Edith Obianuju (2014). *Effect of Total Communication on Academic Achievement Of Pupils With Hearing Impairment In Enugu State*. Department of Educational Foundations (Special Education) University Of Nigeria, Nsukka.
- [23] Eamon, M. K. (2005): *Socio- demographic, school, neighborhood, and parenting influence on academic achievement of Latino young adolescent*. Journal of youth and adolescents 34 (20), 163-175
- [24] Harris, A. and Goodall, J. (2007): *Forthcoming: "Do Parents Know they Matter? Parental Engagement and Educational Achievement: Reviewing the Evidence*. Alma Harris and Dr Janet Goodall Engaging Parents in Raising Achievement Do Parent Know They Matter? Research Report DCSF-RW004 a research project commissioned by the Specialist Schools and Academies Trust University of Warwick
- [25] Hiuhu, B. and Mwaura, S. (2007): *Introduction to Educational Resources Part (Theory)*, KISE Nairobi: Maggie Printers and Stationers
- [26] Hsin-Ling Hung, M.A. (2009). *Factors Associated with the Attitudes of on disabled Secondary School Students toward the Inclusion of Peers Who Are Deaf or Hard of Hearing in Their*
- [27] Heloiza H. Barbosa (2016). *Early mathematical concepts and language: a comparative study between deaf and hearing children*. [http://www.scielo.br/pdf/ep/v40n1/en\\_11.pdf](http://www.scielo.br/pdf/ep/v40n1/en_11.pdf)
- [28] Hsin-Ling Hung, M.A. (2009). *Factors Associated with the Attitudes of on disabled Secondary School Students toward the Inclusion of Peers Who Are Deaf or Hard of Hearing in Their General Education Classes*. The Degree Doctor of Philosophy in the Graduate School of the Ohio State University
- [29] Hitch, G , Arnold, P. & Philips, L (1983) : *Counting processes in deaf childrens Arithmetic*, British Journal of Psychology, 74 429-437
- [30] Hui –Chen Huang ,G and Mason K.L (2008): *Motivation of parental involvement in children slearning : voices from urban African American families of pre schoolers*. Multicultural Education, 15 (3) 20-27
- [31] Heloiza H. Barbosa (2016). *Early mathematical concepts and language: a comparative study between deaf and hearing children*. [http://www.scielo.br/pdf/ep/v40n1/en\\_11.pdf](http://www.scielo.br/pdf/ep/v40n1/en_11.pdf)
- [32] Hickman, R. (2013): *Cambridge Handbook of Education and terms*
- [33] Jarry-Shore, M Dufour, R. (2005): *on common ground: The power of professional teaching communities*, Bloomington, Indiana.
- [34] Jeynes, W. H. (2005). A meta-analysis of the relation of Parental Involvement to urban elementary school student academic achievement. *Urban Education*, 40, 237-329.
- [35] Jennifer. (1995): How negative expectancies and attitudes undermine females mathematics
- [36] Johnston-Wielder, S. & Lee, C. (2008): *Does articulation matter when learning mathematics?* In Johnstone-Wielder, S Lee, C. (2008). Does articulation matter when learning mathematics? In Joubert M. (Ed.) Proceedings of the British society for Research into learning mathematics 28 (3) November 2008.

**International Journal of Novel Research in Education and Learning**

 Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

- [37] Johnson, B. & Christensen, L. (2004): *Educational research: Quantitative, qualitative, and mixed approaches*. Boston: Pearson Education, Inc.
- [38] Kothari, C.R.,(1984) : *Quantitative Techniques*, 2nd ed., New Delhi: Vikas Publishing House Pvt. Ltd.
- [39] Kenya Vision (2030). Koech Educational report-Kenya (1999)
- [40] Keeves JP (1994). *The world of school learning: Selected key findings from 35 years of IEA Research*. The Hague, Netherlands, International Association for the Evaluation of Educational Achievement (IEA)
- [41] Karagiannis, A., Stainback, S., & Stainback, W. (1996): *Historical overview of inclusion*. In S. Stainback & W. Stainback (Eds.), *Inclusion: A guide for educators* (pp. 17-28). Baltimore: Paul H. Brookes
- [42] Katherine, H. (1995): “*teaching mathematics effectively and equitably to females*” Trends and issues no.17 .New York: Columbia University
- [43] Londonderry School District (2012): Focus Monitoring Summary Report
- [44] Lodico, M., Spaulding, D., & Voegtle, K. (2006): *Methods in educational research: From theory to practice*. San Francisco: Jossey-Bass.
- [45] Liong Kon Thai & Mohd. Hanafi Mohd Yasin (2016). Magic Finger Teaching Method in Learning Multiplication Facts among Deaf Students.*Journal of Education and Learning; Vol. 5, No. 3; 2016*
- [46] Liong Kon Thai & Mohd. Hanafi Mohd Yasin (2016). Magic Finger Teaching Method in Learning Multiplication Facts among Deaf Students.*Journal of Education and Learning; Vol. 5, No. 3; 2016*
- [47] Luckner John L., Ann M.Se bald, John Cooney, John Young Iii, Andsheryl Goodwin Lauglo & MacLean (2005): *Vocationalization of secondary school education*. The World Bank, Africa Region. Human development Department, Netherlands
- [48] Miheso, K.M (2002): *factors affecting mathematics performance among secondary schoolstudents in Nairobi Province, Kenya*. Unpublished Thesis, Kenyatta University
- [49] Mbugua Z.K, Kibet, K Muthaa, G.M Reche G Chuka, N (2012): *Factors Contributing ToStudents’ Poor Performance in Mathematics at Kenya Certificate of Secondary Education in*
- [50] Mtuli Tellah Charles (2016). *Assessing The Challenges Of Teaching And Learning Of Hearing Impaired Students Enrolled In Regular Primary And Secondary Schools In Tanzania*. Masters of Education in Administration, Planning And Policy Studies, Open University Of Tanzania
- [51] Musonda, M.N. & Phiri, W. (2017).Emerging Factors Affecting Academic Performance Of Learners With Hearing Impairments At Grade Twelve Examination Level. *The International Journal of Multi-Disciplinary Research, Volume 6, 78-88*.
- [52] Muthomi Samuel, Rwaimba (2016). School based factors affecting learning of Kenyan sign language in primary schools for hearing impaired in Embu and Isiolo counties, Kenya. *Revista Brasileira de Educação do Campo*, 2016, vol. 1, n. 2, pp. 584-605.
- [53] Marschark, M., Shaver, D. M., Nagle, K. M., & Newman, L. (2015). Predicting the academic achievement of deaf and hard-of-hearing students from individual, household, communication
- [54] Moyer, P. (2001): *Are we having fun yet? How teachers use manipulatives to teach Mathematics*. *Educational Studies in Mathematics*, 47(2), 175-197.
- [55] Murray, T., & Arroyo, I. (2002): *Towards Measuring and Maintaining the Zone of Proximal development*. London. Plenum Press.
- [56] Mugenda, O & Mugenda, A. (2010): *Research methods qualitative & quantitative approaches*. Nairobi: African Centre for Technology Studies.

**International Journal of Novel Research in Education and Learning**

 Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

- [57] Maxon, A. B and Bracket, D. (1992): *The hearing impaired child: infancy through high school years*. New York: Andover Medical Publisher.
- [58] Meridith, D.G (1996): *Educational research: An introduction*. New York: LongmanPublishers.
- [59] Moores, D.F. (2000): *Educating the Deaf. Psychology, principles and practices*. Boston: Houghton Mifflin
- [60] Musasia, A. M.; Nakhanu, S. B. & Wekasa, W. D. (2012): *Investigation of Factors that Influence Syllabus Coverage in Secondary School Mathematics in Kenya*: International Journal of Humanities and Social Sciences. 2(15): 51 – 59
- [61] Mercer, N. & Littleton, K. (2007): *Dialogue and the development of children's thinking: a socio cultural approach*. London: Routledge
- [62] Munda, S. W.; Tanui, E. K.; Kaberia, L. (2000): *Relationship between Selected educational Facilities and Students Academic Performance in Secondary Schools in Bungoma District Kenya: Kenya Journal of Education Planning, Economics and Management, Eldoview Graphics, Kakamega, Kenya*.
- [63] Mafa, O & Makuba, E (2013): *The involvement of parents in the education of their children in Zimbabwe Rural primary schools: The case of Matabeleland North province*: In 10SR journal of Research and methods in Education, Vol.1, Issue 3.(F01333743 pdf)
- [64] Marshal, C & Rossman, G. B (2006): *Designing Qualitative Research* (4<sup>th</sup> Ed.) Thousand
- [65] Mansour, M., & Martin, A.J. (2009). Home, parents and achievement motivation: A study of key home and parental factors that predict student's motivation and engagement. *The Australian Educational and Developmental Psychologist* vol.26 (2) (pp111-126).
- [66] McDonnall, M. C., Cavanaugh, B. S., & Giesen, J. M. (2010). The relationship between parental involvement and mathematics achievement for students with visual impairments. *The Journal of Special Education*, 45(4), 204-215. doi:10.1177/0022466910365169
- [67] Marc Marschark, Debra M. Shaver, Katherine M. Nagle, & Lynn A. Newman (2015). Predicting the Academic Achievement of Deaf and Hard-of-Hearing Students From Individual, Household, Communication, and Educational Factors. *Exceptional Children* Vol 81, Issue 3, pp. 350 - 369
- [68] Murray, T., & Arroyo, I. (2002): *Towards Measuring and Maintaining the Zone of proximal development*. London. Plenum Press.
- [69] McDonnall, M.C., Brenda S. Cavanaugh, & J. Martin Giesen, (2016). *The Relationship between Parental Involvement and Mathematics Achievement for Youth with Visual Impairments*. <http://blind.msstate.edu/research/nrtc-publications/2011-2015/pdf/9.pdf>
- [70] Marschark, M., Debra M. Shaver, Katherine M. Nagle, and Lynn A. Newman (2015). Predicting the Academic Achievement of Deaf and Hard-of-Hearing Students From Individual, Household, Communication, and Educational Factors. *Except Child*. 2015 Apr; 81(3): 350–369. doi: 10.1177/0014402914563700
- [71] Muiruri Lucy Wambui (2015). *Determining Classroom Communication And Academic Performance Of Learners With Hearing Impairment; A Case Of Kambui School For The Deaf-Kiambu County-Kenya*. A Thesis Submitted In Partial Fulfilment For The Degree Of Master Of Education (Special Needs Education) In The School Of Education Of Kenyatta University.
- [72] Mbugua, Z.K., Komen Kibet., George Mungiria Muthaa & George Reche Nkonke (2012). Factors Contributing To Students' Poor Performance in Mathematics at Kenya Certificate of Secondary Education in Kenya: A Case of Baringo County, Kenya. *American International Journal of Contemporary Research* Vol. 2 No. 6; 112-119
- [73] Mwenda Jennifer Muiti (2010). *Hindrances to Effective Learning Of Pupils With Hearing Impairment In Meru North District-Kenya*. Masters of Education (Special Education) In the School Of Education of Kenyatta University



**International Journal of Novel Research in Education and Learning**

 Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

- [74] McDonnall, M. C., Cavanaugh, B. S., & Giesen, J. M. (2010). The relationship between parental involvement and mathematics achievement for students with visual impairments. *The Journal of Special Education*, 45(4), 204-215. doi:10.1177/0022466910365169
- [75] Mwenda Jennifer Muiti (2010). *Hindrances to Effective Learning Of Pupils With Hearing Impairment In Meru North District-Kenya*. Masters of Education (Special Education) In the School Of Education of Kenyatta University.
- [76] Mbugua, Z.K., Komen Kibet., George Mungiria Muthaa & George Reche Nkonke (2012). Factors Contributing To Students' Poor Performance in Mathematics at Kenya Certificate of Secondary Education in Kenya: A Case of Baringo County, Kenya. *American International Journal of Contemporary Research Vol. 2 No. 6*; 112-119
- [77] Majeda Al Sayyed Obaid, (2013). The Impact Of Using Multi-Sensory Approach For Teaching Students With Learning Disabilities. *Journal of International Education Research – First Quarter 2013 Volume 9*, Number 1, 345-355.
- [78] Muthomi Samuel, Rwaimba (2016). School based factors affecting learning of Kenyan sign language in primary schools for hearing impaired in Embu and Isiolo counties, Kenya. *Revista Brasileira de Educação do Campo*, 2016, vol. 1, n. 2, pp. 584-605.
- [79] Mwanyuma, R. (2016). *Factors Influencing the Academic Achievement of Deaf Learners in Kilifi County, Kenya: A Case of Sahajanand School for the Deaf*. Factors Influencing the Academic Achievement of Deaf Learners in Kilifi County, Kenya: A Case of Sahajanand School for the Deaf. Research Project Report, Master of Arts in Project Planning and Management, University of Nairobi.
- [80] Mwanyuma, Renalda M (2016). *Factors Influencing The Academic Achievement Of Deaf Learners In Kilifi County, Kenya: A Case Of Sahajanand School For The Deaf*. <http://erepository.uonbi.ac.ke/handle/11295/98964>
- [81] McDonnall, M.C., Brenda S. Cavanaugh, & J. Martin Giesen, (2016). *The Relationship between Parental Involvement and Mathematics Achievement for Youth with Visual Impairments*. <http://blind.msstate.edu/research/nrtc-publications/2011-2015/pdf/9.pdf>
- [82] Musonda, M.N. & Phiri, W. (2017). Emerging Factors Affecting Academic Performance Of Learners With Hearing Impairments At Grade Twelve Examination Level. *The International Journal of Multi-Disciplinary Research, Volume 6*, 78-88
- [83] Muguongo, Grace K. (2016). Influencing Performance In Mathematics In Kenya Certificate Of Primary Education Examination Of learners With Hearing Impairment In Meru County, Kenya. <http://ir-library.ku.ac.ke/handle/123456789/14596>
- [84] Pwokah, E.N. (2016). *Perceptions of Learners On Teaching-Learning Processes And Their Academic Performance In Selected Primary Schools For The Hearing Impaired In Uasin Gishu County, Kenya*. Master of Education (Special Needs Education) In The School Of Education Of Kenyatta University.
- [85] Nur Hannah Saari, Cila Umat, Kamarul Shukri Mat The (2012). Factors Affecting the Learning of the Holy Quran among Severely and Profoundly Hearing-Impaired Children with a Cochlear Implant. *OSR Journal of Humanities and Social Science (JHSS), Volume 2*, Issue 1(Sep-Oct. 012), PP 85-92
- [86] Nyokabi, M.N., Edwards Joash Kochung and Omondi Oketch (2014). Learning Strategies Used by Deaf Students in English Reading Comprehension in Secondary Schools for the Deaf in Kenya: Implications on Academic Achievement. *Educational Research Vol. 5(4) pp. 122-130*, May, 2014 DOI: <http://dx.doi.org/10.14303/er.2014.079>
- [87] Orodho J.A (2005): *elements of Education and Social Science research methods*. Nairobi: Masola Publishers.
- [88] Obukhova, L.F. & Korepanova, I.A. (2009): *The Zone of Proximal Development*: New York, Plenum Press.
- [89] Pimm, D. (1995): *Communicating mathematically*: In K. Durkin & B. Shire (Eds) Language in Mathematics Education. Milton Keynes. Open University Press

**International Journal of Novel Research in Education and Learning**

 Vol. 5, Issue 4, pp: (42-59), Month: July - August 2018, Available at: [www.noveltyjournals.com](http://www.noveltyjournals.com)

- [90] Pomerantz, E.M., Wang, Qian; & Ng, Florrie, Fein-Yin, (2005). *Mothers' affect in the Homework context: The importance of staying positive*. 750 First Street, NE Washington DC
- [91] Pomerantz, E.M., Wang, Qian; & Ng, Florrie, Fein-Yin, (2005). *Mothers' affect in the Homework context: The importance of staying positive*. 750 First Street, NE Washington DC.
- [92] Pwukah, E.N. (2016). *Perceptions of Learners On Teaching-Learning Processes And Their Academic Performance In Selected Primary Schools For The Hearing Impaired In Uasin Gishu County, Kenya*. Master of Education (Special Needs Education) In The School Of Education Of Kenyatta University.
- [93] Rumba, N. (2014). *Institutional Factors Influencing Academic Performance Of Kenya Certificate Of Primary Education On Children With Hearing Impairment In Special Schools In Coast Region, Kenya*. Master of Arts in Project Planning And Management Of The University Of Nairobi.
- [94] Rumba, N. (2014). *Institutional Factors Influencing Academic Performance Of Kenya Certificate Of Primary Education On Children With Hearing Impairment In Special Schools In Coast Region, Kenya*. Master of Arts in Project Planning And Management Of The University Of Nairobi.
- [95] Sarama, J., Clements, D. H., & Vukelic, E. B. (1996): *The role of a computer manipulative infostering specific psychological/mathematical processes*. In E. Jakubowski, D. Watkins, & H. Biske (Eds.), *Proceedings of the Eighteenth Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. (Vol. 2, pp. 567–572)
- [96] Vygotsky, L. S. (1978). *Mind in Society: The Development of Higher Psychological Processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.) Cambridge, MA: Harvard University Press
- [97] Vygotsky, L. (1997): *Educational Psychology*. Florida: St. Lucie Press
- [98] Van der Walt M, Maree K & Ellis S (2008): *A mathematics vocabulary questionnaire for use in the intermediate phase*. *South African Journal of Education, understanding of mathematics and their perception of the learning environment: A case of Form Two students of Bungoma District*.
- [99] Wekesa W.D (2006): *effectiveness of a language based program in school mathematics on students*
- [100] Yara, P.O. and Otieno, K.O (2010): *Teaching/learning resources and academic performance in mathematics in Secondary schools in Bondo District, Kenya*, Kampala international university Kenya. Unpublished thesis, Egerton University. Equal Opportunities Commission.
- [101] Zellman, G. L., & Waterman, J. M. (1998): *Understanding the impact of parent involvement on children's educational outcome* *Journal of Educational Research*. 91(6), 370-380.