

How Utilization of Augmentative and Alternative Assistive Technologies affect the Academic Performance in Primary Schools for Learners with Hearing Challenges in Meru and Tharaka Nithi Counties, Kenya

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Abstract

Despite the government of Kenya supporting the training and employment of teachers to deliver quality education to learners with hearing challenges, the academic performance in primary schools for learners with hearing impairments has been poor. The objective of this study was to assess the effect of augmentative and alternative assistive technology devices on academic performance in primary schools for learners with hearing challenges in Meru and Tharaka Nithi counties, Kenya. The study was guided by the capability theory. The mixed-methods approach and descriptive research design were adopted. The target population was the three primary schools for learners with hearing impairments in Meru and Tharaka Nithi Counties. It interviewed head teachers and County Educational Directors of Education and issued questionnaires to learners. Staff participated in a focused group discussion. The learners, teaching and non-teaching staff, were selected using simple random sampling technique, while the three head teachers and the two County Educational Directors of Education were selected purposively. Descriptive statistics and correlation were used in the quantitative data analysis, while thematic technique was used on qualitative data. Analysis of data was done by computing inferential and descriptive statistics using SPSS. Dismal academic performance was reported in the three primary schools. The study noted inadequate and poorly maintained augmentative and alternative assistive technology devices, inadequate learners' skills, weak guidelines for using the devices and insufficient support from the government. The utilization of augmentative and alternative assistive technology devices was low. The study recommended that the Ministry of Education should purchase all the required augmentative and alternative assistive technology devices, allocate adequate funds for their maintenance and establish a policy that fosters the utilization of augmentative and alternative assistive technology devices in the school. The findings suggest changes in the curriculum, qualification of staff, funding, and teaching pedagogies.

Keywords: *Augmentative and alternative assistive technology devices, hearing assistive devices, hearing challenged learners, Academic performance for the hearing challenged, hearing impairment, primary schools.*

1.0 Introduction

Education, which is viewed as an instrument of fostering social and economic development of an individual and community at large, is a basic right for all children globally. Therefore, there is need to provide equality in access to education for equal academic achievement for all learners. Equality in academic achievement for learners with hearing challenges comes with implications on medium of instruction, methods of teaching, management of classrooms, handling of examinations and learning environment (McClain-Nhlapo et al., 2017; Marschark et al., 2015; Su et al., 2020).

Hearing challenge is defined as a permanent or temporary condition of partial, moderate, severe to conductive diminishing of sensory neural or complete loss of hearing which may be in one ear or both ears, caused by malfunctioning, malformation or damage in the outer, middle or inner ear or hearing control center in the brain (Chinaka & Osisanya, 2020; WHO, 2021). The hearing challenges are categorized into three; sensorineural hearing impairment, mixed hearing impairment and conductive hearing impairment.

Assistive technology is defined by the USA Individuals with Disability Education Act (IDEA) of 2004 as any item, product, or piece of an equipment, either purchased, modified or customized, and used to maintain, improve or increase the functionality of persons with disabilities. Technologies used in assisting people with hearing disabilities include augmentative and assistive technologies (National Institute on Deafness and Others Communication Disorders, 2021; Ashton, 2002; Wein, 2014).

The academic achievement of learners with hearing challenges is emphasized globally through the enactment of regulatory

frameworks and policies that guide the education for children with special needs. Recently, bodies and groups supporting the education of special group of people were formed, including Committee on Care and Rehabilitation of the Disabled, Totally Integrated Quality Education, and Training and Task Force on Special Needs (Jitolee, 2016; Masayi, 2020; Ejore, 2019; Alshutwi et al., 2020). In countries such as China and Australia, the academic performance of learners with hearing impairment continues to be a challenge with widening of difference in academic achievement with each academic level (Kun-man, 2017; Su et al., 2020). The academic achievement of learners with hearing challenges is attributed to several factors including family's socioeconomic status, parents' level of education, students' hearing threshold and levels, language and communication issues, and the environment of the school (Miles et al., 2018; Su et al., 2020).

The case of underperformance of learners with hearing difficulties is also evident in African countries such as Ghana, Ethiopia, Kenya, South Africa and Tanzania (Ndlovu, 2021; Cobbina et al., 2017; Chinaka & Osisanya, 2020; Ertzgaard et al., 2020). Most of studies conducted research on causes of underperformance which were listed to include unskilled teachers in sign language, absence of resource centers, literacy levels of learners, and lack of assistive technologies (Ertzgaard et al., 2020; Chinaka & Osisanya, 2020; Ndlovu, 2021).

Locally, the promulgation of the constitution in 2010 accommodated the people with disabilities by stating that they had a right to access learning institutions and facilities (Constitution of Kenya, 2010, p. 37). Other efforts have been channeled by the

government in realization of equality access to education and leaning facilities. The millennium development goal number 2 is on universal primary education, which aims at providing free primary education and achieving education for all (Kalya, 2020). The academic performance of hearing impaired learners can be assessed through their effectiveness in communicating, spelling and improvement in subjects taught, and the tool for assessing is examinations such as KCPE (Kathare, 2020).

Statement of the problem

The government of Kenya has directed resources and efforts, and further developed policies and established legal frameworks towards the achievement of equality in education access with specific interest on children with special needs. These policies and frameworks include; persons with disability Act of 2003, integrated quality education of 1999, and special national needs education policy framework of 2010 (Johnson, 2021; Jitolee, 2016; Kalya, 2020; Masayi, 2020; Ejore, 2019). The Ministry of Education employed specialists to train teachers at university level in delivery of special need equality education for better academic achievement of learners with hearing difficulties (Jitolee, 2016; Masayi, 2020; Ejore, 2019). Despite all the measures put in place, the academic performance of learners with hearing difficulties has continued to be poor and below average (250 marks), where in inclusive and special schools, a mean of between 100-200 was recorded for learners with hearing challenges (Chinaka & Osisanya, 2020; Masayi, 2020; Ejore, 2019; Jitolee, 2016). The scantiness of studies on assistive technology's influence on academic achievement of learners with hearing difficulties paved way for this study whose main purpose was to investigate the influence of augmentative and alternative assistive technology on academic performance of learners with hearing

challenges in primary schools in Meru and Tharaka Nithi counties. The main purpose of the study was to assess how the utilization of augmentative and alternative assistive technologies affect the academic performance in Primary Schools for learners with Hearing Challenges in Meru and Tharaka Nithi Counties, Kenya. The research hypothesis concluded that the utilization of alternative and assistive technologies does not substantially affect the academic performance of primary schools learners with hearing difficulties in Meru and Tharaka Nithi counties.

Relevant theory

The study adopted the capability theory for the understanding of the study. The capability theory was propounded by Amarta Sen in the 1980s and later improved by Tobobso (2011). The theory states that personal characteristics attributed by disabilities had an impact on the person's capabilities. This theory argues that the academic performance of learners with hearing abilities (capabilities) could be improved by use of information and communication technologies and hence, augmentative and assistive technology.

Augmentative and assistive technology and academic performance

The augmentative technology is a category of assistive technology where audiologists and pathologists facilitate, compensate and enhance both communication and hearing abilities of persons with either temporal, permanent or severe hearing difficulties using aiding devices and techniques (The American Speech-Language and Hearing Association [ASHA], 1992; Shroyer & Chapel, 2020; National Institute on Deafness and Other Communication Disorders [NIDCD] (2021).

Globally, there is evidence of presence and utilization of assistive technology for speech and fluency development among the learners

with hearing disabilities (Maine, 2001; The United Nations Convention on the Rights of Persons with Disabilities [UNCRPD], 2008; Wilfred, 2017; Santoso et al., 2020). The utilization of augmentative and assistive technology in turn leads to improved academic performance of learners with hearing challenges. However, in Africa, the assistive and augmentative technology was underutilized as reported in South Africa (Khalil & Yasmeen, 2020).

2.0 Materials and Methods

The study was based in Meru and Tharaka Nithi special primary schools. It employed a descriptive research design in determining how the utilization of augmentative and alternative assistive technology influence academic performance of learners with hearing difficulties. The target population was 3 special schools in Meru and Tharaka Nithi counties. The respondents were 318; who included 3 head-teachers, 42 teachers, 29 non-teaching staff, 242 learners with hearing difficulties, and 2 County Directors of Education. Simple random sampling technique was adopted in coming up with an appropriate sample size where all the 3 head-teachers and 2 County Directors of Education

3.0 Results and Discussion

The findings of the reliability test indicated a Cronbach’s value of 0.741 which is greater than 0.7 ($\alpha < 0.700$); hence, signifying that the

Locally, there is a dearth of studies on utilization of augmentative technology on learners with hearing difficulties. The existing literature is on the teachers’ attitudes towards augmentative and alternate technologies, where their attitude was reported as positive (Bunning et al. 2014). Another study conducted on augmentative and alternative assistive technology was limited to gender and personality (Masayi, 2020). This led to the need for the current study in Meru and Tharaka Nithi counties.

were purposively selected. In addition, 13 teachers, 9 technical staff and 91 learners were selected for the study. Data for the study was mainly gathered through questionnaires, interview schedules, focus group discussion and document analysis, and analyzed using SPSS where mean and percentages were computed. Piloting was done in Isiolo primary school for hearing impaired learners, to ascertain validity and reliability of the research instruments. The findings were presented in tables and in narratives. Statistical package for statistical sciences (SPSS) version 26, was used to compute Cronbach alpha value, where a value greater than 0.7 indicated reliable data.

data was dependable (Bryman and Bell, 2011).

Table 1

Pupils’ responses from each school

Name of School	Frequency	Percent
Njia primary school for hearing impaired in Meru County	25	29.1
Kamatungu primary school for hearing impaired in Tharaka Nithi County	26	30.2
Kaaga primary school for hearing impaired in Meru County	35	40.7
Total	86	100.0

A total of 91 questionnaires were distributed to the learners and they were all returned. However, 5 were ruled out as defective. Hence, only 86 (94.5%) questionnaires were included for analysis. In the case of head-teachers and county directors of education, all the 3 head-teachers and 2 county directors of education were available for interview representing 100% response rate. In the case of teachers and technical staff, 22 of them were invited for focused group discussion, out of which only 18 (81.8%) turned out. An overall response rate of 94% was achieved, which was attributable to good cooperation by learners and teachers.

Academic performance of learners with hearing difficulties

The study sought to investigate the academic performance of learners with hearing challenges by posing sentiments that measured their level of knowledge, communication skills, literacy and auditory skills, as well as performance in internal and national examinations. Responses were tabulated in a 5-level Likert scale, with SD (Strongly Disagree), D (Disagree), N (Neutral), A (Agree) and SA (Strongly Agree). The findings were summarized in Table 2.

Table 2

Academic performance of learners with hearing impairments

Statements regarding academic performance	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean
Utilization of a listening, augmentative and alternative and alerting devices has enabled me to improve my academic performance.	19 (22.1%)	32 (37.2%)	10 (11.6%)	15 (17.4%)	10 (11.6%)	2.59
Using assistive technology has made me perform better in the continuous assessment tests	21 (24.4%)	23 (26.7%)	21 (24.4%)	11 (12.8%)	10 (11.6%)	2.60
Using assistive devices has made me to perform better in end of term examinations	18 (20.9%)	33 (38.4%)	12 (14.0%)	13 (15.1%)	10 (11.6%)	2.58
My attitudes towards the utilization of assistive technologies negatively affect my academic performance	20 (23.3%)	39 (45.3%)	12 (14.0%)	11 (12.8%)	4 (4.7%)	2.30
Using assistive technologies has boosted my communication abilities	12 (14.0%)	36 (41.9%)	11 (12.8%)	16 (18.6%)	11 (12.8%)	2.74
Using assistive technologies have made me respond quickly to questions in class	18 (20.9%)	28 (32.6%)	6 (7.0%)	20 (23.3%)	14 (16.3%)	2.81
The use of hearing assistive devices has enabled me to remain active in class	18 (20.9%)	33 (38.4%)	12 (14.0%)	13 (15.1%)	10 (11.6%)	2.58
The use of assistive technologies has boosted my ability to participate in group discussions	19 (22.1%)	36 (41.9%)	9 (10.5%)	15 (17.4%)	7 (8.1%)	2.48

The study's findings as indicated in Table 2 indicated that majority of learners, 46 (53.5%) said that using the available assistive technologies had no significant effect on their responses to questions with 34 (39.6%) stating that using assistive technologies assisted them to respond quickly to questions. Similarly, 23 (26.7%) of learners stated that using hearing devices enhanced their concentration in class, whereas 51 (59.3%) of learners disagreed and argued that the assistive technologies did not boost their engagement levels in group discussions. This indicated that the use of augmentative and alternative assistive technology devices had no significant effect on learners with hearing disabilities, resulting to no improvement in academic performance. These findings contradict those of Ahmed (2018) and Khairuddin (2019) who argued that the use of hearing aids, mobile phones and any other assistive technology devices by learners with disabilities increased their levels of participation in classrooms and hence improved academic their performance.

Augmentative and alternative assistive technologies and academic performance of learners

Augmentative and alternative assistive technologies comprise of devices such as communication boards, picture boards, touch screen devices, speech synthesizers, head pointers, modified typewriters, display panels, keyboards, text to voice software, and speech generating devices (Shroyer & Chapel, 2020; National Institute on Deafness and Other Communication Disorders [NIDCD], 2021). The utilization of alternative assistive and augmentative technology devices was determined by posing several questions to learners, and their

responses tabulated in a 5-level Likert scale as shown in Table 3.

The findings from Table 3 indicated that learners showed high levels of disagreement on the utilization of augmentative and assistive technology devices as indicated by an overall mean of 2.49. The study further investigated the sufficiency of augmentative and alternative assistive technology devices. 59 (68.6%) termed the devices as inadequate, 16 (18.6%) implied that they were adequate, while 11 (12.8%) were neutral. In response to whether the school had a variety of augmentative and alternative assistive technology devices, 61 (71%) of respondents disagreed, 17 (19.8%) agreed, while 8 (9.3%) were neutral. This indicated that the augmentative and alternative assistive technology devices were limited in number for learners with hearing difficulties. These findings correlate with Rohwerder (2018) and Masayi (2016) who argued that assistive technology devices for learners with disabilities were limited in quality, quantity, distribution and availability among schools.

Furthermore, the study sought to investigate the level of utilization of the few available augmentative and alternative assistive technology devices in schools where 43 (50%) disagreed, 24 (27.9%) agreed and 19 (24.4%) remained neutral as indicated in Table 3. This implied that there was underutilization of the few available devices. These findings corroborate with MacLachlan and Scherer (2018) and Alasmari (2021) who argued that underutilization of assistive technology devices was attributed to little knowledge of use and poor maintenance of the devices by technical staff. Half of the respondents, 43 (50%) of the learners reported that they lacked skills on the operation of assistive technology devices.

Table 3

Utilization of augmentative and alternative assistive technologies

Statements on augmentative and alternative assistive technologies (N = 86)	SD(1)	D(2)	N (3)	A(4)	SA(5)	Mean
• We utilize a variety of augmentative and alternative assistive technological devices in our school	20 (23.3%)	41 (47.7%)	8 (9.3%)	14 (16.3%)	3 (3.5%)	2.29
• We have adequate number of augmentative and alternative assistive devices in our school	13 (15.1%)	46 (53.5%)	11 (12.8%)	11 (12.8%)	5 (5.8%)	2.41
• Our school has clear guidelines on the utilization of augmentative and alternative assistive devices	15 (17.4%)	27 (31.4%)	22 (25.6%)	18 (20.9%)	4 (4.7%)	2.64
• Learners are sensitized to use augmentative and alternative assistive devices	14 (16.3%)	35 (40.7%)	7 (8.1%)	21 (24.4%)	9 (10.5%)	2.72
• Learners utilize augmentative and alternative assistive devices in classroom	22 (25.6%)	21 (24.4%)	19 (22.1%)	19 (22.1%)	5 (5.8%)	2.58
• Our school has instituted measures / guidelines to foster the utilization of augmentative and alternative assistive devices	33 (38.4%)	16 (18.6%)	12 (14.0%)	16 (18.6%)	9 (10.5%)	2.44
• The augmentative and alternative assistive technological devices are repaired in timely manner	26 (30.2%)	32 (37.2%)	11 (12.8%)	11 (12.8%)	6 (7.0%)	2.29
• I have the skills to use augmentative and alternative assistive devices	22 (25.6%)	21 (24.4%)	19 (22.1%)	19 (22.1%)	5 (5.8%)	2.58

Another aspect investigated was on whether the schools had measures put in place on fostering the utilization of augmentative and alternative assistive technology devices. The responses from learners indicated that 49 (57%) disagreed on the availability of such guidelines, resulting to poor utilization of the

assistive technology devices. Underutilization, low skills and inadequacy of augmentative and alternative and assistive technology devices further led to poor performance of learners with hearing challenges.

From the interview schedules, the head-teachers argued that they provide support to the learners with hearing challenges by repairing non-functioning listening aids, and through funding the repair, purchasing of batteries for hearing aids, and allowing teachers to attend seminars and workshops. These findings were supported by the teachers and technical staff who

4.0 Conclusion

The study noted that the rate of utilization of augmentative and assistive technology devices was low in all the 3 primary schools for hearing impaired learners in Meru and

5.0 Recommendations

The study recommended that the government provides funds through the Ministry of Education for the purchase of augmentative and alternative assistive technology devices for use by learners with hearing challenges. The government should further allocate adequate funds for maintenance, and establish a policy that fosters the utilization of augmentative and alternative assistive technology devices in the school.

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acknowledged support got from the administration. The county directors pinpointed the government's effort towards supporting learners with hearing challenges. The support entailed availing laptops and tablets for the learners. Further, the ministry of education was involved in the training of teachers on augmentative and alternative assistive technology devices.

Tharaka Nithi counties. This in turn affects the level of learners' participation in class and consequently their poor academic performance.

Furthermore, the study recommended that once the devices are bought by the government, head-teachers should enforce policies and measures to ensure full utilization of the assistive technology devices. These findings have pointed out the need for changes in the curriculum, qualification of staff, funding, and the teaching pedagogies.

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