# MANAGEMENT OF ASSISTIVE TECHNOLOGY FOR ENHANCING ACADEMIC PERFORMANCE OF STUDENTS WITH HEARING IMPAIRMENT: A CASE OF SECONDARY SCHOOLS IN ARUSHA

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# CERTIFICATION

The undersigned certifies that he has read and herby recommends for acceptance by the Open University of Tanzania a dissertation entitled: “Management of Assistive Technology for Enhancing the Academic Performance of r Students with Hearing Impairments: A Case of Secondary Schools in Arusha” for partial fulfillment of the requirements for the degree of Master of Education **in Management, Planning and Policy (MEDAPPS) in the Department of policy, planning and administration of** the Open University of Tanzania.

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Date

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I **Isaack Pascal** declare that, the work presented in this dissertation is original. It has never been presented to any other University or Institution. Where other people’s works have been used, references have been provided. It is in this regard that I declare this work as originally mine. It is hereby presented in partial fulfillment of the requirement for the Degree of Master of Administration, Planning and Policy Studies

…………………….………….

Signature

……………………………….

Date

# DEDICATION

To my beloved wife, Ellen Joel, my children Joshua, Joan and my brother Christopher Myovela. It is my desire for them to follow my footsteps.

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# ABSTRACT

This study sought to investigate management of assistive technology for enhancing academic performance of students with hearing impairment in secondary schools in Arusha, Tanzania. The study adopted the capacity theory and a mixed research approach to obtain data from 100 participants teachers (25) and students (75). Data were collected using interviews and a questionnaire. Data were analysed using descriptive statistics for quantitative data and content analysis for qualitative data. The findings unveil managerial issues as important aspect in decision making toward support and making children with hearing loss fully participate in learning. Resources including computers, projectors, hearing aids, and signaling devices have to be well managed to ensure learners with hearing loss access information. Moreover, in seeking for the role played in the effective management of assistive technological devices, the study demonstrates that students feel motivated, facilitates interaction, communication and access to information. Despite the benefits it also indicated that poor school management results to inadequate ATD’s in schools, lack of experts, illiteracy among users affects the application of AT in school and thus poor performance for the deaf. Finally, the study recommended for education stakeholders to work in collaboration to reduce the challenges by providing adequate devices, professional training to the teachers and training students on the use of ATD’s to improve academic performance of the hearing impaired.

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# CHAPTER ONE

# INTRODUCTION AND BACKGROUND TO THE PROBLEM

# 1.1 Introduction

Tanzania is implementing inclusive education in basic education as stipulated in Education and Training Policy (URT, 2014). Government through donor support and its efforts have been purchasing a number of tools and equipment for implementing inclusive education. As such, a number of tools and equipment have been supplied to schools implementing inclusive education, including secondary schools in Arusha. This study examines the management of assistive technology for enhancing academic performance of students with hearing impairment in Arusha region. The introductory chapter presents the background of the study, Statement of the problem, Purpose and objectives of the study, significance of the study and the scope of the study. Furthermore, it contains the definitions of the key terms and the organization of the study.

# 1.2 Background to the study

Hearing impairment has been a major disability challenges in the world and considered a threat to third world countries like Tanzania. Hearing impairment has been describing as the inability to hear below 25 decibels of sound and is categorized as fluctuating or permanent (Agyire-Tettey, Cobbina & Hamenoo , 2017). Globally, education is considered a fundamental human right for all regardless of socio- economic and or physical wellbeing status (Udoba, 2014). According to Alanaz (2021), students who have been deafened in early childhood can be very different

later in life in terms of educational disadvantages. Students with a hearing loss may require accommodations and assistive devices to have the best access to education. Accommodations may be as simple as preferential seating or as complex as wireless assistive listening devices in the classroom. The impact of hearing loss can cause delays in receiving learning material. Students with hearing loss may appear isolated in the learning environment. Participation and interaction in tutorials may be limited.

History has not always been kind to those born deaf; early historical accounts tell us that the ancient Greeks viewed children afflicted with deafness as evidence of God’s anger in 1600s. In the 19th century, institutions were established to provide separate education. This brought new thinking concerning children with disabilities. In 1817 and, thereafter, a period of fifty years, many states in Europe and America established residential schools for the students with hearing impairment (Kirk,Gallagher & Coleman, 2014). From that time on a great change took place throughout the world in attitudes towards the handicapped. According to the World Health Organization (WHO), 60% of all hearing loss in children in developing countries is due to lack of preventive measures.

Globally many educationalists emphasize the use of assistive technology for disabled pupils in order to improve their learning, before the innovation of modern assistive technology pupils with disabled were lack behind. People with disability including those with visual impairment need utmost support for them to acquire and access AT to enhance their participation in learning and contribution to societal development

without unnecessary inhibitions (Kisanga, 2020). Few countries have national assistive technology policies or programs which means access to assistive devices is not universal (World Health Organization, 2015)

Disability statistics in Tanzania indicate that there are 536,038 people who are deaf and hard of hearing (D&H). This is about 1.2% of the whole population and that most of them (55%) are illiterate (National Bureau of Statistics [NBS], 2018) and 45% are also illiterate of Kiswahili, English and other languages (Kisanga, 2019). Regarding education enrolments, statistics indicate that in 2018, there were 8990 pupils who were D&H from primary to secondary schools. 7212 (80.2%) and 1778 (19.8%) were enrolled in primary and secondary schools respectively (URT, 2018a). This indicates a low transition rate from primary to secondary schools for pupils who are D&H in Tanzania (Kisanga, 2019) pieces of research.

Students who are deaf, experience difficulties in understanding speech, even with hearing aid, the hard-of-hearing individuals can use hearing aids to understand speech (Heward, 2006). Comparatively, “cochlear implants do not lead to greater educational participation or inclusion than [what] hearing aids did previously” (Holmstrom & Schonstrom, 2017). It has been reported that, increasing participation in the learning process for pupils who are D&H does not only depend on assistive technology [AT] (hearing technologies) but also it incorporates pedagogical issues (Holmstrom & Schonstrom, 2017). This implies that, availability of AT (hearing aids, cochlear implants, real time captioning; computer technology, video conferencing and sign language interpreters) are important helping students with

hearing loss to access information and enhance classroom communication and participation. without teachers’ knowledge on the use of AT and appropriate teaching pedagogies.

Several types of research shown that the average academic performances of students with hearing impairment (SHIs) are below that of hearing students. most SHIs in African countries such as Kenya, Tanzania, Zambia, Uganda, Malawi, Namibia and Democratic Republic of Congo and Ghana leave “school around the 7th grade. Studies conducted in Nigeria further highlights the fact that there is poor academic performance among the deaf or hard of hearing (D/HH) especially in the English language as compared to their hearing mates (Ikonta and Maduekwe, 2005).

Mwatsaka (2020) investigated on the use of information, communication and technology in promoting learning for hearing impaired learners in special schools in Mombasa in Kenya. The adopted mixed research methods in a descriptive survey design to collate data from the field. Moreover, questionnaires and interview were employed to collect data. The demonstrated that computers and laptops were inadequate to help learners with hearing impairment. Moreover, the study showed that the use of voice communication aids to gain confidence and social credibility at schools. Generally, assistive technological devices greatly helped students who are hearing impaired to access information besides their hearing peers and thus promotes social ability.

In Tanzania, (Kisanga, Wambura & Mwalongo, 2018) explored on assistive technological tools and e-learning user interface in vocational education. Mixed

research methods using questionnaires and semi-structured interview were applied. The findings indicated that challenges associated with poor communication with others include poverty from parents and guardians, unfavorable physical environment, shortage of hearing aids and special need teachers. These challenges increased the demand for African governments to allocate more budgets in education sector to assist schools to purchase adequate assistive technological devices for students with hearing loss.

Assistive technology has potential for students in the classroom because it allows them to be active involved and complete school tasks. There a wide range of devices that can considered assistive technology for example assistive technology such hearing aids, tablets, projector, and roger mic. Different research shown assistive technology can be imperative for students’ achievement in learning. Technology has potential for students in the classroom because it “promotes active student involvement in the learning process and assists students in accessing and organizing information” (Maccini, Gagnon & Hughes, 2002). Assistive technology can be used inside the classroom and out of classroom.

# 1.3 Statement of the problem

During the last five years, a great proportion of pupils with hearing impairment in schools in Tanzania have continued to perform poorly (Kisanga, 2020; Mwanga, 2021; Mtuli, 2015; Rothe, 2022). This poor performance represents barrier to access information compared to hearing students. Despite government measures to boost performance rate of students who are deaf including supply of assistive technology their performance is still poor. It is not clear as to how the supplied AT are managed

in schools especially schools with special needs education unit that still remains dream due to inadequate knowledge. So that there is a need for a study to be carried out focusing on the academic performance in conjunction with management of assistive technological devices. This study was seeking to collect qualitative data to assess management of AT for enhancing academic performance to students in public school.

# 1.4 Purpose of the study

The purpose of the study is to assess the management of Assistive Technological (AT) for enhancing academic performance of learners with hearing impairment in secondary schools in Arusha city in Tanzania.

# 1.5 Specific objectives

* + 1. To identify types of AT tools used to assist learners with hearing loss in public secondary schools in Arusha.
    2. To examine school management practices on the usability of AT on enhancing academic performance for learners with hearing loss in public secondary schools in Arusha.
    3. To ascertain the challenges encountered by school management on the use of AT to improve performance for learners with hearing loss in public secondary schools in Arusha.
    4. To suggest possible measures school management to undertake in the usability of AT to enhance academic performance for learners with hearing loss in public secondary schools in Arusha.

# 1.6 Research questions

1. What are the AT tools used to assist learners with hearing loss in public secondary schools in Arusha?
2. What are the school management practices on ensuring the usability of AT on enhancing academic performance for learners with hearing loss in public secondary schools in Arusha?
3. What are challenges encountered by school management on the use of AT to improve performance for learners with hearing loss in public secondary schools in Arusha?
4. What are the possible measures school management to undertake in the usability of AT to enhance academic performance for learners with hearing loss in public secondary schools in Arusha?

# 1.7 Significance of the study

This study was important because it help researchers, policy makers, teachers, students and their parents, society and the government to know influence of management of assistive technology to enhance academic performance to secondary with hearing impairment.

Policy makers, despite commitment of convention on the Rights of Persons with Disabilities and the Sustainable Development Goals, there remains of lack of political leadership and society towards improving access to assistive technology. Strong political leadership including support from the government is very essential if

the commitments are to be turned into concrete actions to ensure that no one is left behind.

Teachers, the rapid advance of AT simplify the living of students with hearing impairment in recent decade education stakeholder insist the use of AT, so that it seem management of AT is crucial for education development in secondary.

Government, the study can help the government to create a policy-guidelines for the provision of assistive technological devices in inclusive schools. Also, the guideline can help teachers and students to make effective use of technological devices to help hearing impaired students to perform well in school.

# 1.8 Organization of the Study

The study comprises three chapters. Chapter one contains background of the study, the statement of the problem, purpose of the study, objective of the study, research questions, significance of the study, scope of the study and definition of the key terms used in the study. Chapter two concerned with Literature review. This section comprised both Theoretical and empirical literature review and Conceptual framework. Chapter three - highlights methodology of the study. This includes research design, target population, sample size and sampling techniques, research instruments validity and reliability of research instruments, data collection and analysis procedures. Moreover, chapter four focused on data presentation, analysis and interpretation of the findings. Finally, chapter five which concerned about summary conclusions and recommendations.

# CHAPTER TWO

# LITERATURE REVIEW

# 2.1 Introduction

This chapter presents review of literature on management of assistive technologies for enhancing academic performance for students with hearing impairment in selected secondary schools in Arusha-Tanzania. The section contains theoretical and empirical literature review. In the theoretical perspective the study employed Capability theory to guide the study. The section also comprised of conceptualization of terms, empirical literature review organized in terms of the research objectives and finally, conceptual framework, summary and the research gap.

# 2.2 Conceptualization of terms

This part reviewed variety of written sources to conceptualize on important terms and some of Assistive Technological Devices for hearing impairment.

# 2.2.1 Management

Management is simply the process of decision making and control over the action of human beings for the express purpose of attaining pre-determined goals. It is the art of getting things done through and with the people in formally organized groups (Koontz, O'Donnell & Weihrich, 1986) . Management is the art of getting things done through and with people in formally organized groups, the art of creating an environment in such an organized group where people can perform as individuals and yet cooperate toward attainment of group goals, the art of removing blocks to such performance, the art of optimizing efficiency in effectively reaching goals (Koontz 1961). Fayol’s definition describes management as a set of tasks that need to

be performed in order to achieve any and all kinds of business undertakings. So, management is more than managing people, and indeed many definitions state that management is about managing resources in general (Fells, 2000; Schermerhorn 2005).

# 2.2.2 Concept of Assistive Technological Devices

Students with hearing impairment use a variety of technological devices as a strategy to mitigate, or compensate for life difficulties resulting from their hearing loss. Assistive technology has been in the classroom for decades and sometimes even the simplest things can make a huge difference (Kisanga & Kisanga, 2022). Ahmad (2015) documented that Assistive technology has aided pupils with multiple disabilities to improve access and participate in their school and home environments. Hence, the use of assistive technology is important to bridge the gap between hearing impaired and the hearing peers in general classroom.

Assistive technology (AT) includes adaptive and assistive devices that enable improved performance in living independently for people with disabilities. AT not only impacts these people directly, but also could provide caregivers with immediate relief, reduced stress, and help in providing care more easily and safely. Soetan, Onojah, Alaka and Aderogba (2020) and Armstrong (2016) argued that Application of ATD’s and home modifications can reduce home care costs. Therefore, for pupils who are D&H to benefit from the education provided in the inclusive settings, individual differences have to be taken as an opportunity for teachers to increase learning and participation rather than a barrier to learning (Armstrong, 2016).

Studies shows that computer training programs positively influence academic skills, language, mathematics, literacy, and competence in children with disabilities,

improving attention span and learning performance. With computer programs and adapted tools, students with hearing impairments can read materials created on the computer (Armstrong, 2016). Providing technology support to schools of hearing impairment individuals so that the problems experienced in hearing impaired education can be improved, and the rapid rise in educational technologies, reflecting on teachers is important for the development of schools. Looking at the world, it is seen that the studies carried out to increase the quality of education in hearing impaired schools, are supported by technology and contribute to school development (Armstrong, 2016).

Education for hearing impaired is very effective to support with visual means as much as possible that’s helpful to increase their knowledge and skills ultimately academic performance in schools. Assistive technologies are of different types like low and high technological devices. Low- and high-tech assistive devices have been used by persons with disabilities for years. Interventions are used for the persons to overcome their educational and social barriers (Gitlow, Dininno, Choate, Luce & Flecky, 2011).

**FM systems** use radio signals to transmit amplified sounds. They are often used in classrooms, where the instructor wears a small microphone connected to a transmitter and the student wears the receiver, which is tuned to a specific frequency, or channel. Personal FM systems operate in the same way as larger scale systems and

can be used to help people with hearing loss to follow one-on-one conversations (Gitlow et al, 2012).

The cochlear implant (CI) is a surgically-implanted sensor that converts sound inputs into electrical outputs that can be transmitted through the auditory nerve. Cochlear implants are recommended for deaf children with the immediate goal to allow them to acquire basic speaking and listening skills, being the wider objective to improve their social interactions, their school performance and, finally, their quality of life (Sousa, Couto & Martinho-Carvalho, 2018). Cochlear implants are recommended for deaf children with the immediate goal to allow them to acquire basic speaking and listening skills, being the wider objective to improve their social interactions, their school performance and, finally, their quality of life.

Hearing aids are the devices used to amplify sound in a specific range. It helped the hearing-impaired individual to acquire the information. Hearing aids helped person whose hearing is impaired to calibrate their specific hearing loss. Hearing aids do not cure or restore hearing but assist to amplify sounds.

# 2.3 Theoretical Literature Review

The researcher adopted capability theory developed by Amartya Sen in 1974 to guide the study. The theory was based on the assumption that freedom to achieve in general and the capabilities to function in particular (Sen,1995). This study used the capability theory due to the fact students who are hearing impaired and deafened normally allocated in general classroom in inclusive setting. Thus, these students are

required to perform well academically as their hearing peers regardless of hearing challenges they have. Therefore, from this reason there is a need to insist the application of Assistive Technological Devices (ATDs) to enable the learners to elicit their capabilities in classroom.

According to Sen, the major constituents of the capability theory are functioning and Capabilities. He added that functioning are beings and doings of a person whereas, Capabilities refers to various combinations of functions that a person can achieve. Robeyns, (2005) argued that Capability theory is a broad normative framework for the evaluation and assessment of individual wellbeing and social arrangements, design of policies and proposal about social change in the society. Students with hearing loss are also capable of doing well in the presence of assistive technological tools. Societies that surround people with hearing impairments are required to change their attitude towards deaf people and address their needs as well as providing opportunities for the functioning society.

According to Kuhumba, (2018) presented those capabilities are real notions of freedom and the real opportunities people have to lead or achieve a certain type of life whereas, functioning is aspects of living condition or different achievement in living a certain type of life. This could simply mean that Assistive Technological devices offers freedom to students with hearing challenges to access information and live besides their hearing peers. Having access to information in an inclusive classroom enhance their performances in school. Dean (2009) supported those

human beings are defined through relationships which both contribute to, and constrains their autonomy as individual.

Capability theory plays a pivotal role in helping learners with diverse needs within an integrative setting. It enables learners with hearing loss to recognize who they are and what kind of people they want to be. Furthermore, it may arouse interest of learners with special needs to focus on expanding their abilities to learn through assistive technologies. Also, Sen (2009) asserted that capability Approach is an intellectual discipline that gives a central role to the evaluation of a person’s achievements and freedoms in terms of his or her ability to do different things.

Despite the benefit of capability theory in this study (Burchardt & Hick, 2016) argued it is too individualistic and that neglects the ways in which people’s capabilities are interdependent. Therefore, basing on the current study, having assistive technological devices itself does not meet the needs for learners with hearing loss but further required collaboration of all stakeholders such as parents, teachers and students to work in corroboration to improve performance of students with hearing impairment.

# 2.4 Empirical Literature Review

The researcher reviewed variety of scholarly works from the internet to get information about study. Studies reviewed were guided by the research objectives. These include Assistive Technological Devices used by learners with hearing Impairment, Management of ATD’s to enhance Performance of students with Hearing loss, Challenges on the application of ATD’s to enhance performance of learners with H.I in Secondary schools and propose possible strategies for the challenges of ATD’s in secondary schools.

**2.4.1 Assistive Technological Devices for Hearing Impaired Students**Historically, learner’s educational opportunities have been limited by the resources found within the walls of a school. Technology-enabled learning allows learners to tap resources and expertise anywhere in the world, starting with their own communities for example Technology-enabled learning environments allow less experienced learners to access and participate in specialized communities of practice, graduating to more complex activities and deeper participation as they gain the experience needed to become expert members of the community

In Norway Borg, Lindström and Larsson (2011) conducted a study on assistive hearing technology among students with hearing Impairments using face to face interview. The researcher found that the use of amplification systems and hearing aids, help students with hearing impairment to access information in classroom. Similarly, Holt (2019) in USA, added that sophisticated hearing technologies like the use of hearing aids and cochlea implants helped students with hearing loss to access spoken language. Students with hearing impairments can be assisted by hearing assistive technologies to access communication. Hearing aids is much better for students with residual hearing. Also, for students who are totally deafened cochlea implantation is the most useful for them to perceive sound signals.

Also, in Nigeria Soetan and Onojah (2021) carried a study on attitudes of hearing- impaired students towards assistive technology utilization. The study was quantitative using questionnaires in survey method. The findings identified computers, FM amplification systems, infrared amplification, hearing aids and audiometers as types of hearing assistive checklist. The researcher added that these devices enhance student’s self-efficacy and interaction with hearing around them. Similarly, Rabonye (2020) revealed that computer software and audiovisual systems enables students with special needs to access, store, transmit and manipulate information. Amplification devices helped hearing impaired students to get information.

The utilization of audiovisual devices such as projectors enabled students with hearing loss to access information through their eyes and thus relate it with the issues communicated through sign language. Notwithstanding, students having residual hearing loss, amplification devices may be used to boost their hearing capacities and access information as hearing community.

Moreover, in Pakistan another qualitative study was conducted by Farooq and Iftikhar (2015) on learning through assistive devices. Questionnaires were employed to get information from participants. The findings, entailed those types of assistive devices by the hearing-impaired students include FM systems, hearing aids, loop systems and vibrotactile. Also, the researcher added that the use of these technological devices improved communication and academic needs of the learners with hearing impairment. In the same vein, Kala and Chandrakala (2021) on analysing advantages of assistive hearing aids for H.I students in India found that low technological devices like closed captioning, amplifiers, signalling devices, alerting devices as well as high technological devices like computers and screen flash were used to aid hearing impaired students to take notes.

# 2.4.2 Provision of AT for students with Hearing impairment

In supporting learning of students with hearing impairment there is a need to ensure effective supply of assistive technology. According to the study conducted by (Holt,2019) demonstrated that the combination of sophisticated technology and fuller understanding of complex environmental and biological factors that shape development, helped to maximize spoken language outcomes for learners with hearing impairment and contribute to academic development.

Abuzinadah, Malibar and Krause (2017) in Arabia found that deaf students were more interested in computer sciences and other applied sciences. The researcher added that these tools pave the way for learners to access information available in instruction language. Students with hearing impairment can perform well in academics when they are capable to perceive spoken language. Likewise, Rekkedal (2012) showed that assistive listening devices such as teacher-microphones and pupils microphones ensured an enhanced listening environment for such pupils and thus induce a higher level of participation in teaching.

Notwithstanding, Baglama, Haksiz and Uzunboylu (2018). conducted a study on technologies used in education of hearing-impaired individual in Turkey. The study

adopted qualitative method specifically document review as the instrument for collecting data in the field. The researcher unveiled that the use of technologies contributed to the development of academic and linguistic skills of hearing-impaired learners. Moreover, the study showed that persistence use of technology in education of hearing impaired and motivates the learners. In the same vein, (Ahmad, 2015) on the use of assistive technologies in inclusive education found that assistive devices and necessary support services can help students with hearing loss in learning with non-disabled peers in the common classroom, breaking down all barriers which prevent them from having equal access to quality education. Also, in Spain, (Fernández-Batanero, Montenegro-Rueda & Fernández-Cerero, 2022) found that the use of assistive technologies is successful in increasing the inclusion and accessibility of students with disabilities.

Also, in Bangladesh, Rahman and Anam (2001) studied on assistive devices for hearing impaired children in their personal social and academic development. Mixed research methods through interviews, document analysis, observation and questionnaires were applied to get data. The findings entailed that assistive technological device have a great contribution on child’s personal, social and academic development. The researcher further added that hearing aids are essential for all hearing-impaired children who have any residual hearing.

Just like other authors, Chikonzo, Muziringa and Munyoro (2021) assessed the role of AT in enhancing the education experience of students with special needs in higher education in Zimbabwe. Questionnaires were used to get data. The researcher found

that assistive technology provides freedom by enabling respondents to complete academic activities that they were previously unable to do. These activities include studying, reading, writing, researching, web browsing, taking notes and prepare for exams. Also, the study unveiled that AT helped students with special needs to do academic tasks more effectively and obtain relevant academic materials to their studies as well as improve social interaction, self-confidence and peer to peer engagement.

Likewise, in Nigeria, Opeyimi & Maureen (2022) assessed about availability of assistive technological tools towards academic performance of students with disability in Ekit state. The study adopted questionnaire method to get data from the participant in a descriptive case study design. The findings indicated that assistive technological devices among students living with disabilities improves academic performance. Also, the researcher added that teachers should make frequent use of AT tools for instruction in and outside the classroom to make learners participate actively in their learning and being responsible citizen. Also, Silman, Yaratan & Karanfiller (2017) in Cyprus found that assistive technologies motivated students easily to communicate with each other and also with people outside their organization.

Similarly, in Kenya (Delilah & Awoni, 2014) carried a study on relationship between utilization of assistive learning technology and academic achievement of learners in schools for the deaf in Kakamega. The researcher used quantitative and qualitative research methods to collect data. Furthermore interviews, questionnaires and documentation were adopted as instruments of data collection. This study indicated that there is positive relationship between utilization of assistive hearing technology and academic achievement for learners with hearing loss. Also, Abuzinadah, Malibari & Krause (2017) revealed that devising a manner of teaching the deaf and hearing-impaired population will give them opportunity to contribute in teaching. Effective management of hearing technological devises to deaf and hard of hearing students motivates students learning and encourage more interaction in classrooms.

# 2.4.3 Challenges on the Application of Assistive Technological Devices

In seeking for the challenges on the application assistive technological devices, several scholarly works have been reviewed. In Malaysia, (Khairddin, 2018) examined on the inclusion of deaf children in primary schools. Explorative research design was applied in a qualitative study. Notwithstanding, semi-structured interview was used to obtain data from participants. This study indicated that lack of maintenance of assistive technology and limited home school communication, the children do not gain full benefit from technology. The study also showed that school leaders and mainstream teachers were not trained to support deaf children.

Just like teachers, (Hayford & Bonney (2017) in Ghana revealed that majority of students were novice in ICT knowledge and utilization, they had only access to computers during ICT lesson. Additionally, the study pointed that lack of functional computers for private studies, and interest in ICT usage for learning. Illiteracy among the users of assistive technologies in school set back the its utilization in school and

thus in-access of information to H.I students. This leads to poor performance in students with hearing loss.

Similarly, Khomera, Fayiah & Gwayi assessed on the challenges faced by learners with hearing impairments in special school environment in Ghana. Mixed research methods such as questionnaires and interviews were employed to get data from participants. The result indicated that students with special needs education has multiple challenges including shortage of hearing aids, communication barriers with community surrounding school and inadequate funding. In most African countries learners with special education needs experience almost similar challenges. Budget allocated to accommodate the learners is inadequate in many countries which prohibit schools to have inadequate assistive devices for H.I students. As in Ghana, (Mashawi, 2019) in Zimbabwe found that equipment in most schools could not accommodate learners who are deaf.

Moreover, in Nigeria (Bashir, Abdulah and Onyemachi, 2021) researched on integrating Technology for students with learning Disabilities in the University of Nigeria. The structured questionnaires used to obtain data in the field. The findings unveiled those challenges hindering the use of assistive technological devices include instructors’ views, lack of resources, trained instructors, inadequate planning, collaboration time, outdated computers & lack of ICT specialists to teach students with special needs. Also, in USA, (Jacobsen, 2012) on assistive technology for students with disabilities reported lack of systematic and uninformed process limits

teacher’s exploration of possible assistive technology supports and teachers without knowledge time and communication channels slow the adoption process of AT.

Likewise (Eunice & Orodho, 2014) investigated on the effective provision of inclusive education in Kenya. The study used questionnaires and interviews to get data from participants. The result showed, secondary schools embraced inclusive education experienced a myriad of interested constraints ranging from lack of physical and infrastructural facilities, qualified teachers and negative attitudes of parents regarded disabled students. These challenges prohibit the application of assistive technologies in special schools as it discourages teachers and students in teaching and learning process.

# 2.4.4 Addressing challenges for the ATD’s

In this section various articles were reviewed to find out possible measures to be applied for the challenges on application of ATD’s from various parts of the world to assist learners with hearing impairment. In Canada, (Millet, 2019) investigated on accommodating students with hearing loss in a teacher of deaf/hard of hearing education program. This study entailed that providing adequate and appropriate accommodation required time money and institutional support. The researcher added that there should be online learning and exploration of new technology. Students with hearing impairment should be exposed to online learning through proper management of assistive learning technological devices. Assistive technology enabled students to interact and access information as their hearing peers and thus promotes their performance.

Also, in Jordan (Elzraigat & Smadi, 2012) asserted educating students who are and hard of hearing is challenging. The researcher reported the challenges such as lack of remedial and educational programs, insufficient teachers, unequipped schools and lack of institutional and assessment tools. The study recommended to provide schools for students with hearing impaired remedial and educational programs designed to meet the special academic needs, instructional environment and use of visual clues and demonstration in teaching process.

Moreover, (Alzab, 2020) examined on the assistive technology’s effect on the academic performance of students with disabilities. The researcher used mixed research methods such as interview, questionnaires and document analysis to get data. The study recommended to establish AT services and support centers and create an AT act to regulate provision of AT. Likewise, in South Africa, (Rowland, 2015) recommended the need for more technological tools such as iPads and laptops as well as the need for staff training to effectively use technology. The study also recommended to have more educational assistants to support students with more complex needs.

Omoniyi and Olunyi (2014) carried a study on impact of captioned video instruction on Nigerian hearing-impaired pupils’ performance in English language. The researcher used questionnaires particularly primary English Performance Tests to get data. The study recommended that teachers should be trained to design and develop captioned video and infrastructural base for their use in schools. Training on the use assistive technological devices among teachers contributes to the effective utilization of AT to students with hearing impairment. Training provides knowledge and skills to the teachers on the management of ATD’s for hearing impaired individuals and boost their performance. Also, in Zimbabwe, (Mashawi, 2019) recommended that the Ministry of primary and secondary education should provide relevant equipment as well as educating regular school teachers on the use of AT. The researcher added that government had to increase procurement budget for technological equipment to support learners who deaf.

Another related study was conducted by (Florence,2008) about the challenges facing education of learners with hearing impairment in Mumias for the Deaf. This study adopted mixed research methods particularly questionnaires, observation, interviews and documentary analysis to get data. The researcher concluded that the curriculum for hearing impaired learner should be modified to cater for their individual differences and thus, the government should initiate training programs for teachers in special schools. Modification of curriculum have to incorporate the application of assistive technological tools for hearing loss students. This will help them to access information within an integrative setting.

Also, Tanzania Violet (2014) assessed on the access to education and assistive devices for children with physical disabilities. The study demonstrated that involving people with disabilities and their family members while formulating laws, policies and services related to provision of assistive devices could be effective. Family participation and clear policies and guidelines towards the use of assistive hearing technologies plays a pivotal role in the effective utilization of assistive technological

tools for learners with hearing loss. Involving families, pave the way for close related people to insist students to continue using ATD’s and thus promotes their academic performances. Moreover, (Kisanga,2019) recommended teacher education curriculum to incorporate a special course on teaching pedagogies that address diverse needs of students who are deaf in inclusive education setting.

# 2.5 Summary and Research Gap

The reviewed literature indicated assistive technological devices beneficially enabled students with hearing impairment to access information. These instruments include high and low technological devices. Thus, however these devices are present, there are challenges for its application in schools and college students. Also, the reviewed scholarly works indicated that several studies were carried for a long time. For example, Yelkipier, Namale, Esia, & Donk (2012), (Mwatsaka 2012), Rahman & Anam (2001), Jacobsen (2012), El-Zraigat & Smadi (2012) and Delilah & Awori (2014) to mention few. These studies paved the way to have current study to cope with educational changes that have been happening for the time being.

Moreover, majority of the studies were conducted in metropolitan countries. The countries might have different context in terms of education administration curriculum and content given to students with hearing impairment as well as level of technology reached. For example, in Relkedal (2012), in Norway, Jacobsen (2012; Hold, 2019) in USA, Omuniyi & Olunyi (2014) in Nigeria and Baglama, Haksiz & Uzunboyhi (2018). The places might be highly developed in technological tools used compared to the field of study.

Subsequently, the reviewed literature indicated very few studies done in Tanzania on the assistive technological devices for hearing impaired. Also, the researcher noted that, there is no similar or related study carried in the selected field of study. It is in this regard the researcher desired to assess management of assistive technological devices and performance of students with hearing impairment.

# 2.6 Conceptual Framework

Figure 2.1 represents the conceptual framework which describes the relationship between independent, dependent and intervening variables on the Management of Assistive Technological Devices and performance of learners with hearing impairments in public secondary schools.

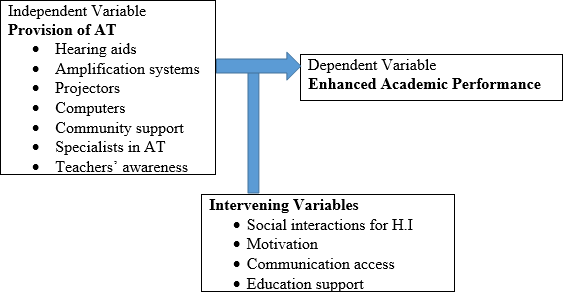


Figure 2.1 Conceptual Framework

The conceptual framework describes mutual relationship between the variable. The figure entails that application of technological devices such as hearing aids, amplification devices like FM systems, computers and projectors leads to good academic performance for hearing impaired students. Also, the devices can yield the desired objective under community supports, provision of experts, adequate devices and teachers, awareness on tit its effective use. Moreover, some challenges regarding application of the technological devices may happen at the institutional level especially when the devices are inadequate to meet the demand of learners with hearing loss, community attitudes and inadequate specialist teachers in school. Proper mitigation of the challenges promotes interaction, motivation, communication access and education support for hearing impaired resulting to good academic performance.

# CHAPTER THREE

# RESEARCH METHODOLOGY

# 3.1 Introduction

This chapter presents research methodology on the enhancement of academic performance for learners with hearing impairment through management of assistive technological devices in the selected public secondary schools in Arusha. The chapter comprises research approach, research designs, the target population, sample size and sampling techniques. It further contains description of the research instruments such as questionnaires, interviews and observation. Moreover, this section also constitutes validity and reliability of the instruments, data collection and analysis procedures as well as ethical consideration.

# 3.2. Research Approach

The study employed a mixed research approach by combining both qualitative and quantitative methods in collecting data from the field. The rationale behind the application of mixed research methods was to get deeper understanding on the particular study. The combination of the two research methods aimed at triangulating data which might not obtained through single approach. According to (Almeida 2018; Bamberger 2012) asserted that mixed research methods promote greater understanding of stakeholder’s perspectives on the nature of the intervention. Thus, this study advocated the approach to get deeper understanding of the phenomenon. Notwithstanding, it aimed at balancing the weakness of each other as there is no method which is complete by itself.

Subsequently, (Best & Khan (1998) argued that research approach helps to structure data collection, data analysis and interpretations. Integrating the two methods is important in problem solving. Generally, quantitative research methods helped the researcher to understand the problem by developing ideas on the study topic. Moreover, the for qualitative approaches the study unveils thought and opinions of the respondents for better understanding of the study issue.

# 3.3 Research Designs

According to Creswell (2012:20), research design are specific procedures involved in the research process such as data collection, analysis and report writing. The study adopted mixed research design specifically convergent parallel design. The design provides an opportunity to the researcher to conjoin both qualitative and quantitative research methods to collect and analyzes data. Creswell and Pablo-Clark (2011) argued that convergent parallel helped the researcher to relate the findings in qualitative and quantitative terms and combine it for the interpretation. Therefore, the researcher visited the selected schools and collected qualitative and quantitative data at once that is, once participants from students and teachers were filling the questionnaires, the researcher was interviewing the head of school. This design was cost effective and reduced time of frequent visits in the same station during data collections process. Similarly, the utilization of the design was due to the fact that each method could compensate the weakness of each other thus obtaining credible information on the study issue.

Furthermore, quantitative data was collected through questionnaires and observation checklists while for qualitative data phenomenology study was used to get data from school administrators. The rationale behind the use of phenomenology was to seek for respondent’s experience on the management of assistive technological devices for enhancing academic performance of students with hearing impairment in the selected schools in Arusha.

Moreover, the use of convergent parallel provided the researcher an opportunity to analyze qualitative and quantitative data in separate and combined the results for the interpretations. The application of the design in the current study helped the researcher to get accurate and in-depth information about particular study.

# 3.4 Target Population

Target population referred to people involved in the study to give the required data. Creswell (2012:14) defined the target population as a group of individuals or a group of organizations with some common defining characteristics in which the researcher identified and study. Thus, basing on nature and commonality, the researcher selected two public secondary schools to get the participants. Also, the researcher involved teachers, students with and without hearing loss and heads of selected schools to provide data. Furthermore, the researcher selected one hundred (100) participants from the total population in the selected public schools. The schools were inclusive by nature and therefore share the same environment in terms of service provision. Notwithstanding, these schools were selected due to the fact that

they share similar characteristics and challenges in terms of running costs and the nature of teaching and learning environment.

# 3.5 Sample size and sampling

**3.5.1 Sample Size**

Sample size refers to the exact number of participants used to provide data for the study. The sample size for the current study was obtained through Yamane’s formula for calculating the sample size. According to Yamane (1976) Sample size (n)=

 whereby n= sample size, N=total population and e = level of precision. The level of precision can be represented in form of 0.1, 0.05 or 0.07 coefficients depending on the size of population.

The study obtained the sample size from 300 hundred total population representing students. Then from 300 population, the sample size (n) =  which means

n= 

= =

n= = 75, therefore the sample size for students were 75 participants drawn from two inclusive schools.

Subsequently, teachers constituted thirty participants in total Then to get sample size from teachers n= then,

n=  =

n=  = 23.07. Hence, the sample size for teachers were twenty-three (23) participants. School heads were sample purposely and thus the formula was not applicable. For this reason, the study included two school heads whose schools were used to give participants for data collection. This makes a total sample size of one hundred (100) sample size from the total population.

# 3.5.2 Sampling procedures

The process of selecting sample involved both probability and non-probability sampling techniques. In probability sampling technique participants have no equal chance of being selected while in non-probability each respondent has opportunity of being selected and included in the sample. Probability sampling was used to get schools used in the data collection process. The study used two inclusive schools in Arusha due to the fact that they share similar experiences and challenges. Likewise, probability sampling technique particularly purposive sampling was used to select two (2) heads of schools. The participants were selected basing on the judgement of the researcher and that they have more experience on the effects of Assistive technologies and the academic performance of the hearing-impaired students. Also, they were selected because their supervisory role for school management.

Moreover, non-probability sampling technique was used to select participants from teachers and students. Through simple random sampling techniques, the researcher

selected seventy-five (75) students to include in the sample. Participants from students included forty-five (45) with hearing impairment and thirty (30) without hearing loss. Similarly, stratified simple random sampling was used to select participants from form three and four students. The participants were selected due to their maturity, school experience on the application of assistive technologies in the chosen schools. Furthermore, the researcher selected the participants based on gender, that is 33 males and 42 females to provide data. Notwithstanding, teachers constituted thirty (30) from the total population. Stratified simple random sampling was used to select participants responsible to teach form four and form three classes. This was due to their experience in instructing learners with hearing loss within inclusive classroom. The researcher also selected the participants basing on gender whereby eight (8) males and fifteen (15) females were used to give data.

Also, the study included two (2) school heads to get data in the administrative section. Purposive sampling technique was used to get school administrators. School heads whose schools were selected for the study directly were involved in the study. The rationale behind is that, they are responsible to ensure students with and without disability performed well in academics. Also, it’s their responsibility to ensure adequate and well-trained teachers, as well as adequate teaching and learning facilities in school to enhance student’s performance.

# 3.6 Instruments of Data Collection

Kothari (2000) contends that the most desirable approach with regard to selection of appropriate technique for data collection depends on the nature of the particular

problems and on the time and resources available. The researcher collected data through an interview, observation and questionnaires to answer research questions. The instruments used to get the most credible information on enhancing performance of students with hearing impairment through management of assistive technological devices.

# 3.6.1 Questionnaires

Questionnaire were employed to gather required information from field, information was gathered from twenty-three (23) special needs teachers, 75 students with and without hearing impairments. Questionnaires were constructed in form of open and closed ended questions. Closed ended questions intended to seek for specific information about the study while open ended aimed at giving participants freedom to express their opinions or views. This was unlike close-ended questionnaires which limits respondent to give his/her opinions. After all, questionnaires offer greater anonymity and freedom to the participants in providing the required data in absence of the researcher. In the same line, it is cost effective, economical and have uniform procedures to find out the required data.

Moreover, questionnaires were organized into five sections which were addressed to both teachers and students. Section one contained questions intended to seek for demographic characteristics of the participants. Section two constituted questions relating to objective one. This objective aimed at finding types of assistive technologies used for hearing impaired students in inclusive schools. Also, section three involved questions about effective management of assistive technological devices on enhancing academic performance for hearing impaired learners. The fourth section comprised of questions regarding to objective three particularly, challenges facing teachers in the application of assistive technological devices. The section five had questions concerning the measures for the challenges in the application of assistive technological tools to promote academic performance for learners with hearing impairments.

# 3.6.2 Interview

Just like questionnaires interview was applied to get data from the participants. The researcher conducted in-depth interview to the schools, heads to ascertain respondents’ experiences on the study issue. Interview was applied because it provides a freedom to the participants to express his/her opinions, feelings and emotions on study topic. Similarly, interviews offered to the researcher opportunity to prompt the respondent to get most reliable and credible information. Therefore, the researcher prepared five interview questions which demanded the participants to give data. Generally, as questionnaires, the questions were prepared basing on the research objectives to triangulate the data obtained through questionnaires and observation checklists.

The disadvantages of interview include, being prone to subjectivity and bias on the side of the interviewer and having a limited number of respondents due to time limit (Cohen et al, 2007). Knowing this, the researcher provided equal opportunity to the respondents to give their opinions and avoid bias.

# 3.6.3 Observation

Observation is used in the social sciences as a method for collecting data about people, processes, and cultures **Invalid source specified.**. Also, **Invalid source specified.** asserted that observation is one of the most basic data collection methods. It involves ‘seeing’ things, and recording and analysing what is seen. In this study researcher used observation technique in order to find the reality of what was revealed by the participants through interview and questionnaires. In the observation, the researcher prepared an observation checklist such as seeking for type of ATD’s in school. For example, Availability of projectors in the class, Students won hearing aids, computer class, and signalling devices in school.

# 3.7 Validity and Reliability of the Instruments

In order to get credible information, the researcher examined the research tools to find out whether it could yield the needed data. To fulfil his intention validity and reliability of the instruments were tested.

# 3.7.1 Validity of the Instruments

Validity seeks to establish if instruments measure what they are purported to measure Validity is defined as the extent to which a concept is accurately measured in a quantitative study **Invalid source specified.**. To seek for validity, both content and face validity was observed to achieve research objective. For the case of content validity, the tools were given to reviewers with sound knowledge and experiences in research to seek if the questions could yield the intended results. Upon their critique and comments, the researcher was able to correct the instruments to meet the demand of the study.

Also, face validity was checked through careful preparation of the questions basing on sequence and series of objectives, arrangement and grammar that could aid the researcher achieve the intended goal. Thus, to seek for face validity, the work was taken to professional proof readers to examine and comment. This helped the researcher to make correction for the comments made.

# 3.7.2 Reliability of the Instruments

Reliability refers to the degree in which a research instrument yields a consistent result on repeated trials (Gay, 1992). In this study, the researcher used split-half technique to test the reliability of the instruments. After all, split-half method helped the researcher to serve time and avoid frequent visits in the stations to collect data. In this study the researcher obtained 0.86 correlation coefficient after testing the two groups which indicated the instruments were valid and reliable.

# 3.8 Data Collection Procedures

The process of collecting data involved both quantitative and qualitative methods. Quantitative data was collected through questionnaires and observation checklists. The questionnaires were addressed to the teachers and students with and without hearing loss to fill in. Also, Qualitative data was obtained through interviews. The researcher prepared interview questions which were addressed to heads of the selected public secondary schools in Arusha. Finally, observation method was used by the researcher to crosscheck the reality of the presence and application of assistive technologies in the selected schools.

# 3.9 Data Analysis

This study is mixed research which involved both quantitative and qualitative data. Therefore, the process of analysing data contained the combination of the two. Quantitative data was analysed through computer software commonly known as Statistical Package for Social Sciences (SPSS). Through the programme the data was coded and entered into a computer, then it was analysed through descriptive analysis in frequency and percentages. The analysed data were presented by tables and figures for the interpretation. Moreover, qualitative data was analysed through content analysis methods whereby data were assigned into themes category, summarization and interpretation.

# 3.10 Ethical Consideration

Ethical consideration refers to the accepted norms and standards for conducting research. In this study the researcher observed the rules and norms for to carry out the study. First, before the process of data collection, he obtained a permission letter (research clearance) from the Open University of Tanzania that allowed him to conduct a study in Arusha region. Upon arrival in the researcher asked for permission to all relevant authorities including Regional Administrative Secretary (RAS), District Administrative Secretary (RAS), City Executive Director (CDE) and made prior arrangement with school heads on how the process of data collection took place. Moreover, the researcher asked participants willingness to give the required data by providing the consent form in which each participant signed before data provision. The consent explained the purpose and procedures of data collection. Similarly, the researcher ensured confidentiality and of the information given, anonymity and protection of the participants. In seeking for the safety of respondents, the names of the participants and institution used in the study, was not mentioned and thus, were presented inform of letters and numbers. Finally, the acknowledgement of all sources of data basing American Psychological Association (APA) sixth edition was applied to avoid plagiarism.

# CHAPTER FOUR

# DATA PRESENTATION AND DISCUSSION OF THE FINDINGS

# 4.1 Introduction

The section comprises participants’ response rate, demographic information of the participants, presentation, analysis and interpretation of the findings basing on the research objectives:

* + 1. To identify types of AT tools used to assist learners with hearing loss in public secondary schools in Arusha.
    2. To examine effective management of AT on enhancing academic performance for learners with hearing loss in public secondary schools in Arusha.
    3. To ascertain the challenges encountered by teachers on the use of AT to improve performance for learners with hearing loss in public secondary schools in Arusha.
    4. To suggest possible measures to undertake in the application AT to enhance academic performance for learners with hearing loss in public secondary schools in Arusha.

# 4.2 Respondent characteristics

This study involved teachers, students and heads of schools to provide data on enhancing academic performance for students with hearing impairment through management of assistive technologies. The study used seventy-five students (75), Twenty-three (23) teachers and two (2) heads of schools to provide data as shown in Table 4.1 showed that the study focused to collect data from one hundred (100) respondents. The participants were expected to come from teachers, students and school heads. The findings showed that targeted sample size was reached effectively thus data was collected efficiently at one hundred percent.

# 4.2.1 Teachers Demographic Characteristics

Teacher’s demographic characteristics involved age, gender, education qualification and teaching subjects. Teacher’s demographic characteristics aimed at seeking

|  |  |
| --- | --- |
| appropriateness of participants to give the required data. demographic information of teachers.  **Table 4.2 Teachers Demographic Characteristics (n= 23)** | Table 4.2 presents |
| Items Frequency | Percentage |
| **Age**  25 years and below 3 | 13.0 |
| 26-35 years 12 | 52.2 |
| 36-45 years 5 | 21.7 |
| 46 years and above 3 | 13.0 |
| **Gender**  Male 8 | 34.8 |
| Female 15 | 65.2 |
| **Education qualification**  Diploma 2 | 8.7 |
| Postgraduate diploma 2 | 8.7 |
| Degree 16 | 69.9 |
| Postgraduate degree 3 | 13.0 |
| **Teaching Subjects**  Arts 12 | 52.2 |
| Science 8 | 34.8 |
| Business studies 2 | 8.7 |
| Religious studies 1 | 4.3 |
| Source: Field Data, 2022 |  |

# 4.2.2 Distribution of Teachers by Age

Teachers’ age was useful to the study. Understanding participants age intended to seek for teacher’s eligibility to teach secondary school students. The findings in able

* 1. showed that 13.0 percent had age of 25 years and below, 52.2 percent aged between 26 to 35 years, 21.7 were between 36 to 45 while 13.0 percent ranged from 46 years and above. The findings indicated that majority (87 percent) of the participants from teachers were aged above 26 years. This implies that teacher had a right age to teach secondary school students as they are matured enough to guide adolescents. Moreover, it is indicated that the teachers were eligible to assist students with hearing impairment through assistive technological devices.

# 4.2.3 Distribution of Teachers by Gender

Gender of the participants were represented in terms of male and female variables. Distribution of teachers by gender aimed at seeking for the allocation of teachers in inclusive secondary schools. Table 4.2 showed that 65.2 percent were female teachers and male teachers composed 34.8 percent. The findings indicated female teachers were more distributed in inclusive secondary schools compared to the male teachers. Also, it shows that currently there is community awareness on the issues of women empowerments and provision education for girls. Moreover, it is indicated unbalance between male and female teachers may affect decision making power in terms of discussion regarding provision assistive technological devices to students with hearing impairment. Female teachers may express their dominance when seeking for consensus.

# 4.2.4 Distribution of Teachers by Education Qualification

Education qualification for teachers was also useful in this study. This aimed at seeking for whether teachers had the required qualification to teach in inclusive secondary school. Teachers’ education qualification included variables such as diploma, postgraduate diploma, degree and postgraduate degree. The findings in table 4.2 postulated 8.7 percent had diploma in education, 8.7 had postgraduate diploma while 69.6 percent had degree in education and postgraduate degree composed of 13.0 percent.

The result entailed that majority of teachers (82.6) percent in the selected secondary schools had degree and postgraduate degree in education which is the most eligible qualification for teachers to teach in inclusive classes. Moreover, the result showed that in the selected secondary school’s teachers who had diploma in education could be mentored by the most qualified teachers to enhance students’ performance.

# 4.2.5 Distribution of Teachers by Teaching Subjects

The study also focused on seeking for which subjects were mostly preferred in the selected inclusive secondary schools. In table 4.2 showed that in the selected secondary schools, 52.2 percent of teachers were teaching arts subjects, 34.8 percent teach science, 8.7 percent were teaching business studies and 4.3 preferred to teach religious studies.

The findings demonstrated that majority of teachers in the chosen inclusive schools preferred arts, business studies and religious subjects. This could affect the use of assistive technological devices for hearing impairment students. Also, for proper management of assistive technological devices, science subjects should be promoted to attract teachers to use technology such as computers and projectors to teach hearing impaired.

# 4.2.6 Students Demographic Information

Students demographic information included age, gender, class level, and combination. Students’ information aimed at seeking about their school experience and level of understanding on the application of assistive technological devices in the selected public secondary schools in Arusha. Also, students’ demo graphs helped the researcher to identify the appropriateness of the participants to give the required data as represented in Table 4.3.

# Table 4.3 Students demographic Characteristics (n=75)

|  |  |  |
| --- | --- | --- |
| **Items** | **Frequency** | **Percentage** |
| **Age**  14 years below | 2 | 2.7 |
| 15-16 years | 48 | 64.0 |
| 17-18 years | 21 | 28.0 |
| 19 years and above | 4 | 5.3 |
| **Gender**  Male | 33 | 44.0 |
| Female | 42 | 56.0 |
| **Class**  Form one | 2 | 2.7 |
| Form two | 11 | 14.7 |
| Form three | 33 | 44.0 |
| Form four | 29 | 38.7 |
| **Combination**  Arts | 45 | 60.0 |
| Science | 30 | 40.0 |
| **Total** | **75** | **100.0** |

**Source:** Field Data August 2022

The study intended to seek for students age to examine maturity of students to provide the needed data. The age of students was presented in ranges such as 14 years and below, 15-16 years 17-18 years and 19 years and above. The result in table

4.3 indicated, 2.7 percent of students were aged between 14 years and below while 15-16 years constituted 64.0 percent, 17-18 years were 28.0 percent and 19 years and above contained 5.3 percent. The findings showed that majority of student’s 97.3 percent aged above 14 years. This simply could imply that participants from students were matured enough to give the required data. Also, the result entailed that these participants had good age that could help them to think critically on the questions asked and thus they could give accurate data. Students’ gender was also useful in the current study. The gender of the participants was presented in form of male and female variables. The researcher planned to seek for students’ gender to assess access of education between boys and girls.

The result in table 4.3 indicated, 44.0 percent were males while 56.0 percent represents female gender. The findings showed that girls allocated in the selected secondary schools were many compared to boys. This implicated, there is community awareness about education for the girls in the region in which girls are given opportunity to get secondary education regardless of their disability challenges. Notwithstanding, 44.0 percent of male gender demonstrated that there is unbalanced campaign on education of children which gave more opportunities to girls than boys. Thus, there is a need to emphasize education for boys and girls at equal campaign to create educated community and eliminate biasness.

Students’ class level was intended to find out the experience of students in school. In this section the researcher was interested to examine eligibility of students to give the required data on management of assistive technological devices for hearing impaired students. Participants class level included form one, form two, form three and form four. For the purpose of the study, forms three and forms four were the target. These were focused because of their school experience and various matters on the management of assistive technological devices and performance of students with hearing loss in the selected public secondary schools.

The result from table 4.3 demonstrated that forms one was 2.7 percent, forms two represented by 14.7 percent, forms three 44.0 percent while forms four covered 38.7 percent. From the findings, the study identified, majority of students (82.7 percent) were from forms three and form four. These were eligible students since they have good experience in school compared to their counterparts. Moreover, the participants constituted 17.3 percent from forms one and two were the deaf students who are mostly affected by lack of or inadequate assistive technological devices in school. The researcher concluded that all participants from students regardless of their class levels were eligible and experienced enough to give needed data.

Students’ combination was represented in form of arts, and science variables. The aim was to seek for subjects preferred by participants and how the preferred subjects

promote the application of assistive technological devices among students in school. The findings in table 4.3 pinpointed 60.0 percent were in line to arts subject, while

40.0 percent like science subjects. From the findings, the results entailed that majority of students in the selected secondary schools in Arusha had interest in arts rather than science. This could affect the use of ATD’s since the devices requires science application. Therefore, for this reason there is a need to encourage students to appreciate science by providing adequate science instruments to advance their technological appreciation.

# 4.3 Assistive Technological Devices for learners with Hearing Loss

The study intended to examine types of assistive technological devices used for learners with hearing impairments in the selected public secondary schools in Arusha. Participants involved were students with and without hearing loss, teachers and head of schools. Students and teachers were given questionnaires to fill in while heads of schools were interviewed.

Participants from teachers were asked to accept whether there are Assistive Technological devices for learners with hearing loss in their schools. The result showed that 73.9 percent replied “Yes” there are while 26.1 percent said “No”. as represented by Figure 4.1.



# Figure 4.1 Teachers response on availability of ATD’s in schools (n=23)

Source: **Field data September, 2022**

From the findings, Figure 4.1 showed that in the selected public secondary schools ATD’s were present as those replied “Yes” outlay the neglected participants. The findings entailed that there are efforts to ensure learners with hearing impairment are educated besides the hearing peers. Also, teachers and students were asked to list types of ATD’s found in their school. Participants identified hearing aids, computers, projectors, and signaling devices (Table 4.4).

# Table 4.4: Types of ATD’s for hearing impaired learners (N= 98)

Teachers Responses Students Responses

# Types Frequency Percentage Frequency Percentage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hearing aids | 8 | 34.8 | 10 | 13.3 |
| Projectors | 2 | 8.7 | 23 | 23.7 |
| Computers | 13 | 56.5 | 2 | 2.7 |
| Signaling devices | 0 | 0 | 40 | 53.3 |
| **Total** | **23** | **100.0** | **75** | **100.0** |

**Source;** Field Data, September 2022

# Hearing aids

The findings from table 4.4 indicated that 34. 8 percent from teacher’s category and

13.3 percent from students group revealed that hearing devices are commonly used as assistive technological tools for hearing impaired. The hearing aid is the most famous ATD’s used by learners who are deaf and hard of hearing to access information. Hearing aids help the deaf learners to amplify sound from their environment in such a way that he/she can hear. The findings concurred with (Holt, 2019) in USA who reported that sophisticated hearing technologies like the use of hearing aids and cochlea implants helped students with hearing loss to access spoken language. The access of spoken language through application of hearing aids assists learners with hearing loss to restore their capacity to learn with hearing peers and boost their academic performance. Similarly, conceptual framework indicated that management of hearing aids to learners with hearing impairment enabled them to have good academic performance. Also, (Dean, 2009) in discussing capability theory supported those human beings are defined through relationships which both contribute to, and constrains their autonomy as individual. Thus, hearing aids provides an autonomy to the deaf person to get information from the source without being passed in other media as it distorts factual information.

# Projectors

Projectors were also technological devices mentioned by both teachers and students. Table 4.4 showed that 8.7 percent from teachers and 23.7 percent argued projectors as ATD’s that could help learners with deafness to get information through visualization. Although the participants mentioned projector as an assistive technological device for the hearing-impaired learner through observation, the researcher did not find teachers to use the device for teaching except in one selected secondary school. Also, during the interview an interviewee in selected school A said that;

Projectors are most useful devices for the hearing impaired as they depend much on visualization, but, in real sense we have only three projectors used by more than 24 teachers. Can you imagine twenty- four teachers using four projectors. I am still encouraging community members to support learners with hearing loss at least to donate more projectors (Interviewee 1 School A, September 2022).

The findings entailed that although projectors are most useful technological devices for the hearing impaired particularly in inclusive setting, some schools either have few or do not have it. This could implicate those learners with hearing impairment lack their rights to interact with source of materials and rely on sign language interpreters which may have distorted information.

# Computers

Table 4.4 showed that teachers said computers are used as technological devices by

56.5 percent while students pointed on 2.7 percent. The findings showed that computers are important devices to help students with hearing loss to interact with the world through internet access. Computers also used concurrently with projectors to help learners with hearing loss.

Also, in the other hand majority of students could not mention computers as assistive technological devices since majority of teachers were using their personal computers thus, in the selected schools there were no computers allocated for students learning. This deprived the rights of students with deafness to access information as revealed by (Rabonye 2018) that computer software and audio-visual systems enables students with special needs to access, store, transmit and manipulate information.

Also, during the interview, an interviewee from school B said; We do not have computer class that can help these learners with hearing loss to learn through. This is challenge to us because majority of the deaf students like using computers but they do not have access (Interviewee 2 School B, September 2022).

In the same vein, Mwatsaka (2012) the demonstrated that computers and laptops were inadequate to help learners with hearing impairment in Kenya. Computers are useful to help learners with hearing impairment to take notes and search for learning material.

# Signaling devices

Other devices which were mentioned by the participants are signalling devices. The findings from Table 4.4 indicated 53.3 percent represents signalling devices as useful technological tools used by learners with hearing loss. These alerting devices are normally used to inform students with hearing impairments about various information in the classroom and in school environment. For example, danger of fire or bell ringing. Despite the usefulness of these devices in the selected public secondary schools none of the devices was present. This shows that students with

hearing loss were deprived from various important information and thus they are not motivated with their school environment. The result can result to poor academic performance as they feel isolated from the mainstream comm

# 4.4 Usability of ATD for Hearing Impaired Learners

In this objective the study was intended to assess the effective use of assistive technological devices and performance of students with hearing impairments in the selected public secondary schools. Usability was important as it is through how devices are used; we measure whether the devices are well or ill managed. Teachers, students and head of schools were involved in the provision of data. Also, questionnaires, interviews and observation used as instrument of data collection. Moreover, the questionnaires helped the researcher to obtain data from teachers and students while heads of schools were interviewed. Participants from teachers were asked to state whether there was effective management of ATD’s in inclusive secondary schools in Arusha. The findings showed that 21.7 percent replied “Yes” while 78.3 percent said “No’’. Similarly, when students were asked whether they used assistive technological devices in learning process the data showed 17.3 percent on “Yes” and 82.7 said “No’’ as indicated in Table 4.5.

# Table 4.5: Participants Responses on the Application of ATD’s (N=98)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Percentage | Frequency | Percentage |  | Frequency |
| Yes | 18 | 78.3 | 61 | 82.7 |
| No | 5 | 21.3 | 14 | 17.3 |
| **Total** | **23** | **100.0** | **75** | **100.0** |

# Responses Teachers (23) Students (75)

**Source**; Field Data, September 2022

Just like teachers and students, during the interview an interviewee reported that Assistive technological devices like hearing aids and are not present in school. Thus, students do not use it. Even though those who possessed it privately do not use. Some deaf students afraid of being stigmatized once recognized by hearing community (Interviewee 2, September 2022).

The findings entailed that in the selected public secondary schools, application of assistive technological devices in teaching and learning process was minimum. This condition may result to poor academic performance for learners with hearing loss. Likewise, the findings indicated that there was ignorance on the use of ATDs in which some learners were afraid of being recognized as deaf students thus, refused to use assistive hearing devices. Therefore, there is a need to provide education on the use of ATD’s to all learners with hearing loss to assist them in learning process.

Also, teachers were asked to explain how effective management of ATD’s can lead to good academic performance in secondary schools. The results showed that management of assistive technology can enhance classroom interaction and help learners with hearing since they are interested with computer application in learning. The findings were similar to (Abuzinadah, Malibar & Krause, 2017) in Arabia who found that deaf students were more interested in computer sciences and other applied sciences.

Subsequently, participants were asked to state how does effective management of assistive technology can lead to performance of students with hearing loss. The result showed that 30.4 percent said it helped deaf students to access information easily during teaching and learning process, 21.7 revealed it assisted them for social

interactions, 17.4 percent argued it facilitate communication while 13.0 percent unveil that motivates hearing impaired learners. Afterward, when students were asked the similar questions, they bring out that 28.0 percent presented on increase of socialization, 38.7 percent on active participation in learning and 33.3 percent said it help students to access information. The findings from all respondents are shown in table 4.5.

# Table 4.6: Effective Management of ATD’s for Hearing Impaired (N= 98)

Teachers Students

# Responses Frequency Percent Frequency Percent

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Access information | 7 | 30.4 | 25 | 33.3 |
| Social interaction | 5 | 21.7 | 21 | 28.0 |
| Facilitate communication | 4 | 17.4 | 0 | 0.0 |
| Motivate learners | 3 | 13.0 | 0 | 0.0 |
| Participation in learning | 4 | 17.4 | 29 | 38.7 |
| **Total** | **23** | **100.0** | **75** | **100.0** |
| **Source:** Field data, September 2022 |  |  |  |  |

**Access information**

Table 4.6 indicted that 30.4 percent of teachers and 33.3 percent of students unveiled, when ATD’s are managed effectively can help deaf students to access information easily in the classroom. The findings were in line to *(*Abuzinadah, Malibar & Krause, 2017) who found that assistive technological tools pave the way for learners to access information available in instruction language. This could mean that ATD’s play a pivotal role in making amplification of sounds to help hearing impaired students to access information. Despite the usefulness of the devices in the selected public secondary schools there were inadequate assistive technological devices. This therefore deprived the rights of hearing-impaired students to access information given by their classroom instructors.

As well in the interview a respondent argued that;

Technological devices like computers, projectors and hearing aids are most useful but we do not have enough of it. When available, as teachers we face challenge on who should be given and at what time. Sometimes when you give a student do not return thus are lost. We really face challenges on its management, as they are few and those few we cannot maintain when they need maintenances, we do not have experts to repair. This is the challenge to we teachers however, we still emphasizing all people with good will to our students to supports us to get these assistive technologies to boost performance of students with hearing loss (Interviewee 2 School B, September 2022).

The findings were similarly with the conceptual frame work as it showed that proper management of ATD’s under community support can yield good performance to hearing impaired and thus elicit their capacity to interact with others. Likewise, Robeyns, (2005) in discussing capability theory asserted that Capability theory is a broad normative framework for the evaluation and assessment of individual wellbeing and social arrangements. This implies that students who are deafened can present their social wellbeing in the presence of assistive technological devices.

# Social interactions

Social interaction was another variable articulated by participants in the field of study. Both students and teachers presented that proper management of assistive

technological devices increased interaction for the hearing impaired in inclusive classes. Table 4.6 indicated that 21.7 percent of teachers and 28 percent of students respectively presented that socialization among hearing and none hearing-impaired students can be improved under the assistive technological devices. This result was similar to (Rahman & Anam, 2001) who entailed those assistive technological devices have a great contribution on child’s personal, social and academic development. However, teachers and students found it useful to have assistive technological devices in school to promote socialization, still in the selected schools the devices were unavailable. This promoted the poor performance for the learners whose hearing is impaired.

# Active participation in learning

The findings in Table 4.6 demonstrated that application of assistive technological devices in inclusive schools enabled students with hearing loss to participate actively in the learning process. It is indicated that 38.7 percent of teachers and 17.4 percent of students represented the variable. Notwithstanding in the interview an interviewee asserted; “Students with hearing loss shows their eagerness to learn when teachers used computers and projectors during teaching and learning (Interviewee 1 school A, September 2022)”. The findings entailed that availability of assistive technologies in inclusive schools is useful to help learners with hearing loss participate actively in the learning process. The results were resembling (Opeyimi & Maureen, 2022) that teachers should make frequent use of AT tools for instruction in and outside the classroom to make learners participate actively in their learning. Thus, there is a need for the government and all education stakeholders to emphasize and provide assistive

technological devices in inclusive schools to promote active learning and higher academic performance.

# Facilitate Communication

Classroom communication is an important aspect on academic performance of the students. The findings in table 4.6 illustrate that 17.4 percent of the participants from teachers in the selected school reported ATD’s as useful devices to promote and facilitate classroom communication. The use of hearing aids and amplification devices enabled hearing impaired learners to get information from various sources in the classroom. In school A, the researcher found that these devices were unavailable and thus students with hearing loss depends on the second-hand information as they were dependent upon sign language interpreter.

Assistive technology lead students to have wrong information because when a message passed from source to interpreters then to deaf students, it may be distorted and hence poor performance. Afterward, the assistive technological devices enabled students with deafness to catch a message directly from the source without being interpreted or signed. The findings were similar to (Silman, Yaratan & Karanfiller, 2017) he asserted that assistive technologies motivated students easily to communicate with each other and also with people outside their organization. Notwithstanding, (Sen 1995) in presenting capability theory, reflected on the assumption that hearing impaired should have freedom to achieve in general and the capabilities to function in particular. Thus, students whose hearing is impaired are in

high demand of ATD’s to function independently and boost their academic performance.

# Student motivation

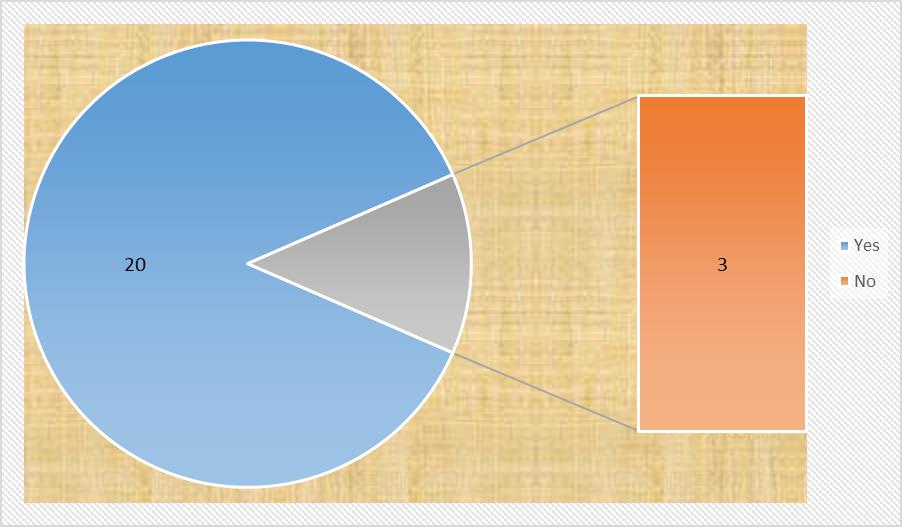
Subsequently, participants argued that the application of assistive technologies for hearing impaired motivates students and feel as part of the mainstream community. Table 4.6 indicated 13.0 percent of the respondents said effective management of ATD’s motivates students with hearing loss. Although assistive technological tools seem to motivate deaf students still in the selected schools there were adequate and other school lack the assistive technological tools. The finding was contrary to conceptual framework which showed that effective management of assistive technological devices like computers hearing aids and other amplification tools motivate students with hearing loss and thus improve their classroom performance. The result obtained was also similar to (Silman, Yaratan & Karanfiller, 2017) in Cyprus who found that assistive technologies motivated students easily to communicate with each other and also with people outside their organization.

# 4.5 Challenges on the Application of ATD’s for Hearing Impaired

This objective, the researcher intended to ascertain for the challenges on the application of assistive technological devices for students with hearing loss in the selected schools. As well students, teachers and heads of schools were invited to provide the required data. The interviews, questionnaires and observations were employed to get data from the participants.

Participants were asked to state if there are challenges associated in the application of assistive technological devices for learners with hearing loss in schools. The result showed that majority of the participants (87.0 percent) replied on “Yes” while only

13. 0 percent indicated on “No” as shown in figure 4.2.



**Figure 4.2 Participants response on availability of challenges for ATD’s (Teachers n=23)**

**Source**: Field Data, September 2022

Subsequently participants were asked to name the challenges for the application of assistive technological devices in the selected secondary schools. The findings indicated inadequate ATD, s in school, inadequate professional development for teachers, inappropriate use of ATD’s among students, inadequate experts on ATD, s and illiteracy as shown in Table 4.5.

**Table 4.7 Challenges for the application of ATD’s (N= 98)**

# Teachers (N=23) Students (N=75)

# Responses Frequency Percentage Frequency Percentage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Inadequate ATDs | 9 | 39.1 | 8 | 10.7 |
| Lack of professional development | 4 | 17.4 | 14 | 18.7 |
| Illiteracy | 4 | 17.4 | 27 | 36.0 |
| Inadequate experts in ATD’s | 6 | 26.1 | 15 | 20.0 |
| Lack of administrative support | 0 | 0.0 | 11 | 14.7 |
| **Total** | **23** | **100.0** | **75** | **100.0** |
| **Source:** Field Data, September 2022 |  |  |  |  |

**Inadequate assistive technological devices (ATD’s**

Application of assistive technological tools to the learners with hearing impairments challenges both teachers, students and heads of schools. In presenting the challenges faced by teachers and students in using ATD’s in the selected schools, 39.1 percent form teachers and 10.1 percent indicated on inadequate assistive technological devices in school. Inadequate or lack of computers, projectors and amplification devices drastically affects its application in schools. In the selected schools these devices were inadequate and thus it was not easy for teachers and students to use it. For example; in one of the selected inclusive schools, it was found that there were only four projectors that could be used by eight class streams. This implies technological equipment for the hearing impaired were inadequate to meet the demand of students. In the same vein, the second school had none of them except for the computers used for administrative purposes and not for teaching and learning. This condition lessens the application of assistive technological devices in school. The findings were in line to (Mashawi, 2019) in Zimbabwe who found that equipment in most schools could not accommodate learners who are deaf. Also, in

the conceptual framework it is indicated that institutional challenges may affect the use of assistive technological devices and thus poor academic performance.

# Lack of professional development

This was another factor presented by the participants in the selected inclusive schools. Professional development for teachers in school play significantly in updating teacher’s knowledge on effective management of assistive technologies for hearing impaired. The findings in table 4.7 demonstrated that 17.4 percent of teachers revealed that teacher’s professional development on the use of ATD’s was unavailable. This hinders the progress of its applications in the selected schools. Just like teacher’s 18.7 percent of students pointed on the similar result. The findings unveiled the need to emphasize teacher’s professional development to boost and update teacher’s knowledge on the usage of ATD’s.

# Illiteracy

Lack of technical knowledge on the use of assistive technologies were mentioned as a challenge towards its application. Table 4.7 showed that 17.4 percent of teachers and 36.0 percent of students said illiteracy challenges the application of assistive technological devices in the selected schools. The findings implicated those teachers and student did not have adequate knowledge on using the technological instruments for the hearing impaired. Inadequate knowledge of teachers and students on the computer usage and other technological devices for the hearing impaired prohibit them to use it effectively. In the field of study, the researcher found that students do

not have computer knowledge and some of them do not have knowledge of amplification devices like hearing aids and signaling instruments.

The findings concurred with (Hayford & Bonney (2017) in Ghana who reported that majority of students were novice in ICT knowledge and utilization, they had only access to computers during ICT lesson.

Notwithstanding, during the interview an interviewee said;

We do not have some technological devices like hearing aids, audiometers and other amplification devices but in the other side some technological devices like computers and projectors not all teachers can use it (Interviewee1 school A, September 2022).

The theme could mean that there is inadequate knowledge among teachers on the use of ATD’s that prohibit students to benefit it and thus poor performance. Computers are useful for the hearing impaired to learn and getting notes for learning. If teachers do not have adequate knowledge on the use of computers, then students cannot be taught through it. In the conceptual framework it is indicated that lack of expertise and institutional barriers can prohibit effective management of technological devices and thus performance of hearing impaired can also be affected.

# Inadequate experts in ATD’s

Lack of experts on assistive technological tools is among other factors presented by participants. The variable was represented by teachers in table 4.7 by 26.1 percent

while participants from students constituted 20.0 percent. The findings showed that in the selected field of study there were inadequate specialists that could facilitate the application of assistive technological devices. These experts included specialist teachers. The government of Tanzania is still working to ensure schools have adequate teachers but some teachers allocated in the selected school do not have special needs education training. Notwithstanding, the researcher could not find any Information and Communication (IT) specialist to assist learners with and without hearing loss in the selected inclusive schools. The finding was similar to (Bashir, Abdulah and Onyemachi, 2021) in Nigeria who found that challenges hindering the use of assistive technological devices included lack of ICT specialists to teach students with special needs. The situation weakens the application of ATD’s and thus poor performance for learners with hearing loss.

# Lack of administrative support

Some participants thought that there is inadequate administrative support on the application of assistive technological devices. The theme was unveiled by 14.7 percent of the participants. This however different form the real situation in the selected field of study whereby school administrators are working seriously to ensure ATD, are available in the selected school. For example, during the interview, an interviewee asserted that;

We always discuss with teachers to see how we can assist learners with hearing loss through assistive technologies. Knowing the importance of ATDs like computers and projectors, I asked for donors and people with good will to assist in getting the required tools and currently we have

given three projectors by donors (Interviewee 2 School B, September 2022)

The findings implicated there is administrative support however, participants did not recognize it.

# 4.6 Addressing Challenges for the Application ATD’s

In this objective the researcher intended to seek for the possible measures for the challenges that hinder application of assistive technological tools to the hearing impaired. Techers, students and heads of school were involved in the provision of data. The participants provided data through filling questionnaires, and answering interview questions.

To seek for the possible measures for the challenges on application of ATD’s the researcher finds it necessary to use Likert scale. The scale involved statements such as provision of adequate assistive devices, training teachers on the application of ATDs, training students on the appropriate use of ATD’s, promoting awareness to school administrators on the ATD’s for hearing impaired. The scale involved 1=strongly agree, 2= agree, 3=moderate, 4= disagree and 5= strongly disagree.

Participants were required to indicate whether provision of adequate assistive devices in schools could help in promoting the use of ATD’s in school. The result showed that 5.3 percent strongly disagree on the statement, 10.7 percent disagree, 5.3 percent

were uncertain, 60.0 percent agree while 18.7 percent strongly agree as shown in figure 4.3.



# Figure 4.3; Provision of adequate assistive technological devices

Source**: Field Data, September 2022**

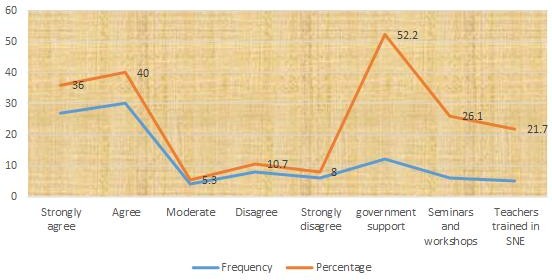
Findings in figure 4.3 illustrates that majority of the participants (78.7) percent agreed on the statement. Although large percent agreed on the theme, some respondent’s (5.3 percent) were uncertain. These respondents perhaps do not have adequate knowledge on study topic and thus raise the need to have specialist teachers. It is important for the government, community and other education stakeholders to work in collaboration to ensure inclusive schools are provided with adequate technological tools to help learners with hearing loss to interact and access information. Likewise, when participants from teachers were asked what should be done to enhance the application ATD’s in inclusive secondary schools, 20 participants (86.9 percent) unveiled on the provision of adequate ATDs The results implicated that in the selected public schools there were no adequate computers, projectors and amplification devices which prohibits learners with hearing impairment to learn and socialize effectively.

In the conceptual framework, community support was indicated as an important aspect to ensure schools have adequate assistive equipment to help hearing impaired. This is however different from (Violet, 2014) who demonstrated that involving people with disabilities and their family members while formulating laws, policies and services related to provision of assistive devices could be effective. Therefore, there is a need to involve all community members to work in collaboration with the government and families for the deaf to provide adequate ATD’s.

# Training teachers on the application of ATD’s

Participants from students were asked to locate whether providing training to teachers could help to promote application of assistive technological devices in inclusive schools. The result showed that 8.0 percent strongly disagree, 10.7 percent disagree, 5.3 percent were moderate that means they were uncertain on the theme, while 40.0 percent agree and 36.0 percent strongly accepted the statement. On the other hand, when participants from teachers were questioned to give their opinion on things to be done to ascertain the adequate devices in school, they mentioned government support by 52.2 percent, 21.7 percent said training teachers on its application, 21.7 percent said providing trained teachers with SNE, and provision of seminars and workshops represented by 26.1 percent as indicated in Figure 4.4

From the findings, figure 4.4 showed that majority of the participants (76.0 percent) agreed on the importance of training teachers on the application of ATD’s. Technical knowledge on the use of technological devices is important for teachers to facilitate the effective use of computers, projectors and hearing aids to students with hearing loss. Subsequently, participants from teachers demonstrated the importance of conducting training to teachers in Special Needs Education (SNE) as well as conducting seminars and workshops as shown in figure 4.4. Also, some participants

5.3 percent were moderate while 18.7 disagreed on the variable. This implicated that these respondents either do not have adequate knowledge on ATDs for hearing impaired or were reluctant to give the data.

# Figure 4.4 Participants responses on Measures for the challenges of ATD’s

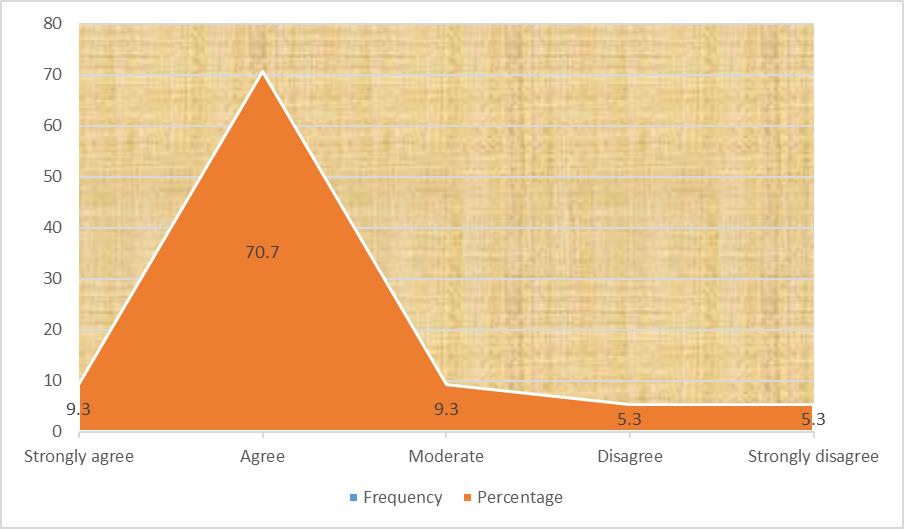
Source: **Field Data, September 2022**

The findings concurred with (Alzab, 2020; Rowland, 2015) who recommended to establish AT services and support centers and create an AT act to regulate provision of AT as well as the need for staff training to effectively use technology. In the selected field the researcher found that some teachers neither have training in using

ATDs nor in SNE. The situation increased the demand on training in the specified area through workshops and professional development to assist hearing impaired to use it for better academic performance.

# Training students on appropriate use of AT

Moreover, other participants unveiled on the provision of education on the appropriate use assistive technological devices. The findings showed that 5.3 percent disagree strongly, 5.3 percent disagree, 9.3 percent were uncertain, 70.7 percent agreed while 9.3 agreed strongly as shown in figure 4.5.



# Figure 4.5: Student training on appropriate use of ATD’s

Source: **Field Data, September 2022**

Figure 4.5 illustrates that majority of the participants 80.0 percent agreed on the statement. This implicated that in the selected field students seem to inadequate skills on the use of AT. Through observation the researcher discovered that some students

have some technological devices such as hearing aids but do not use it in class. Likewise, the researcher discovered that some students do not have computer knowledge. This is perhaps caused by lack of training on the appropriate use of the devices. The finding was contrary to (Omoniyi & Olunyi, 2014) as he recommended that teachers should be trained to design and develop captioned video and infrastructural base for their use in schools. This simply meant that it is not only teachers required training but also students as well. In the interview an interviewee asserted that;

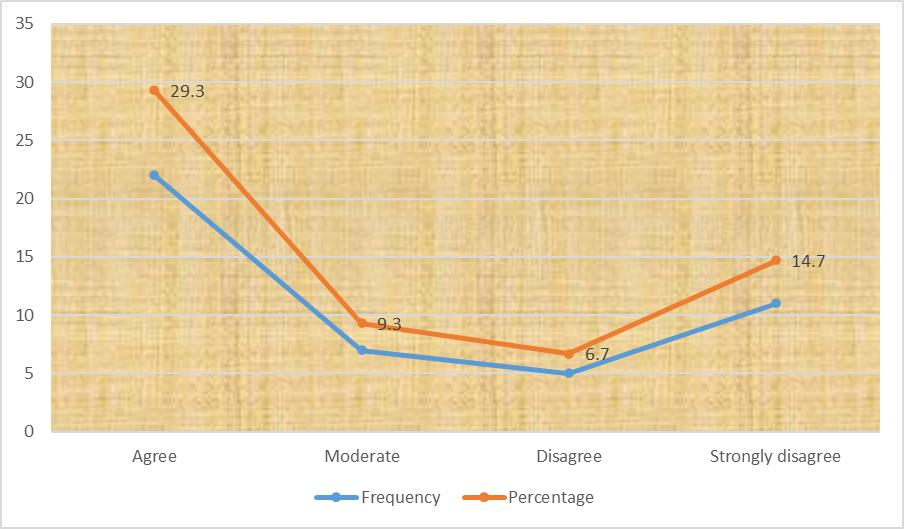
It is important to provide training for teachers and students on the application AT. This should be done in workshops and seminars to enable good management and utilization of ATD’s for the hearing impaired (Interviewee 1 School A, September 2022).

# Raising awareness to school administrators on the use of AT

Also, participants presented that there is a need to raise awareness among heads of school on the application assistive technological devices in school. Students were required to indicate whether awareness of school heads may result to effective management of ATs for better performance of students with hearing loss. The result in table 4.6 demonstrated that 40.0 percent strongly agreed, 29.3 percent agreed on the given variable, 9.3 were uncertain they are neither agree nor disagree, 6.7 disagree and 14.7 percent were disagreed strongly as shown in Figure 4.6

The finding in figure 4.6 showed 69.3 percent were in view that there is a need to educate school administrators and keep them aware on the AT. School administrators

play significantly in emphasizing the use assistive technologies in school. In the selected field of study, it was found that in school where school administrator was aware on the importance of assistive technologies for hearing impaired students, there were efforts made to involve community, donors and families to seek for ATD’s to help hearing impaired. For example, in school B the researcher discovered that there were few projectors and computers to assist in teaching and learning for the deaf students. This could simply mean that the school administrator was aware on the benefit of ATD, s to deaf students. Also, the collected data revealed that some participants (21.7 percent) neglected on the statement, that means either they were not aware or they could not see the contribution of school heads on the application of ATD’s in school.



# Figure 4.6: Awareness of school administrators on AT

Source: **Field Data, September 2022.**

# CHAPTER FIVE

# SUMMARY CONCLUSION AND RECOMMENDATIONS

# Introduction

The purpose of the study was to find out the influence of assistive technological devices on enhancing academic performance for learners with hearing impairments in inclusive secondary schools in Arusha. This chapter presents the summary, conclusions and recommendation. Furthermore, it comprises limitation and delimitation of the study and recommendations for further research.

# Summary

The background showed that students with hearing impairment performed low in academic compared with the hearing peers. These students fail to socialize in learning due to communication breakdown. From this view point assistive technological tools like hearing aids, computers, projectors, tablets and other amplification devices seems to be remedy for the hearing impaired to restore their lost freedom of accessing information. The researcher reviewed various scholarly works from the internet to complement the current study. The reviewed literature was in two sections particularly theoretical and empirical literature review. In theoretical review the study anchored on Capacity Theory which based in the assumption that individual whether hearing or hearing impaired should function as particular. Empirical literature review was organized based on the objective of the study.

This study based on the general layout step by step which explained how the findings were obtained in the methodology section. Through the findings, it was found that

assistive technological devices such as hearing aids, computers projectors, and other amplification devices are useful to enable students with hearing loss to restore their capacity to socialize within teaching and learning environment. Subsequently, the findings unveiled lack of effective management of the devices and ignorance among the users which prohibit learners with hearing loss to access firsthand information resulting to poor academic performance. Similarly, some challenges such as inadequate AT devices, inadequate expertise in school as well as lack of training in the specified field, hinders the effective management of the ATD’s and lead students to perform beyond the required standard in academics.

Finally, training and retraining of teachers and students as well can, restore effective application of assistive technologies and improve performance of students with hearing loss in inclusive setting. Likewise, collaboration among government, community families and other education stakeholders is important in the provision of adequate assistive technologies for the hearing impaired in inclusive schools.

# Conclusions

Basing on the findings, the researcher concluded that assistive technological devices such as hearing aids, computers, projectors and other amplification devices are useful for the hearing-impaired learners. These devices enable them to access firsthand information rather than depending on sign language users in which the information provided may be distorted. In the similar vein, however there were challenges indicated on the application of ATD’s, the challenges can be tackled through collaboration, training both students and teachers as well as creating awareness for school administrators on its importance. Effective management of AT’s can boost the performance of students with hearing loss.

# Recommendations for practice

In seeking for the types of assistive technological devices the researcher found that the devices were many such as hearing aids, computers, projectors and other amplification devices. The tools were important to help the hearing impaired to access information individually however, in the selected secondary schools these technological tools were inadequate. Following the challenges that prohibits effective use of ATD’s these recommendations were made;

The government should create a policy guideline that guide the availability of adequate assistive technological devices in inclusive secondary schools in Tanzania. The policy should clearly define how learners with hearing loss can use it to improve their academic performance.

Also, there should be collaboration between all education stakeholders such as teachers, parents, students and families on guiding students on the appropriate use of assistive technologies. Working in corroboration can lead to its effective management and thus yield the required results.

Moreover, there should be training among teachers and students on the application of assistive technological devices in school. Training through seminars, workshops and professional development on information and communication technology can improve teachers and knowledge and skills on AT usage in inclusive schools. Likewise, teachers should conduct training to the students on computer and other devices usage to get the expected results.

Notwithstanding, school administrators should be prepared before their appointment to run inclusive schools. This will increase their awareness to give necessary supports to the teachers and students enhancement of ATD’s in their stations.

# Limitation and Delimitation of the Study

The process of planning, collecting data and report writing for this study was not easy. The researcher encountered a variety of challenges including getting research permit. This process took sometimes because of the nature of administration bureaucracy. The process took almost two weeks in making follow up from regional administration, district and making arrangement with school heads on data collection process. Moreover, some participants were reluctant to return the questionnaires during the process. In addition, research is costly, therefore the researcher faced financial challenges as well as time constraints

To deal with research permit challenges, the researcher was tolerable and strictly made follow-ups until the success. Moreover, knowing that some participants may be reluctant due to either perception or negative attitudes on research issues, the researcher planned for additional questionnaires during the process. Thus, the situation did not affect the research process. Finally, to deal financial crisis the researcher asked loan from the bank to facilitate the research work.

# Recommendation for Further Research

The study focused on the management of assistive technological devices for enhancing academic performance for learners with hearing impairment in inclusive public secondary schools in Arusha. The results showed that application of AT devices is a vital for hearing impaired as it helped them to access firsthand information during learning. The researcher invites other researchers to carry out more researches from other regions in Tanzania particularly, public and private inclusive schools. This can help to come up with the solution for the poor performance of students with deafness in inclusive schools in Tanzania.

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# APPENDICES

**APPENDIX 1: Questionnaires for Teachers Introduction**

Dear Teacher,

My name is Isaack Pascal, a student at the Open University of Tanzania pursuing a Master of Education Administration, Planning and Policy Studies. I am carrying out research with the title Enhancing the Academic Performance of Students with Hearing Impairments Through The Management Of Assistive Technologies: A Case Study In Arusha City Council In Tanzania". The purpose of this questionnaire is to find out the application of AT and academic performance for learners with hearing impairments in public secondary schools. This research is a part of the requirements of the Master of Education Management, Planning and Policy Studies. I would like to ask for your consent to participate in this research knowing that the information that you provided will be treated confidentially and not be disclosed to any person.

Consent Declaration

I have read and understand the information above and procedures pertaining to this interview for research purpose. I also understand that by signing this letter. I have agreed to participate in this study with consent and willing to provide the required data voluntary.

Signature Date

# Section 1: Demographic Information

Instructions

Please respond to the following questions by putting a tick in the box [√] and where an explanation is required fill in the spaces provided.

1. What is your age?
   1. 25 years and below [ ], B. 26 -35 years [ ], C. 36-45 years [ ], D. 46 years and above [ ]
2. What is your gender?

A. Male [ ], B. Female [ ].

1. What is your educational qualification?
   1. Diploma [ ], B. Postgraduate diploma [ ], C. Degree [ ], D. Postgraduate degree [ ]
2. What is your teaching subjects?
   1. Arts [ ], B. Science [ ], C. Business studies D. Religious studies [ ]
3. Do you have training in special needs education
   1. Yes . B. No

# Section 2: Types of Assistive Technological Devices in Secondary Schools.

1. Do you have Assistive technological devices to assists learners with hearing impairments in your school? A. Yes [ ], B. No [ ].
2. Outline types of Assistive Technological Devices for Learners with hearing impairments found in your School.

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1. Do students with hearing impairments use the Assistive Technological devices during teaching and learning process. A. Yes [ ] B. No [ ]
2. Outline types of Assistive Technological devices used by learners with hearing impairments in the learning process in your school.

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# Section 3: Effective Management of Assistive Technological Devices

1. Do you think Assistive technological devices are used effectively in your school.

A. yes. B. No

1. Briefly explain how Assistive Technological devices are used effectively to promote performance for learners with hearing impairments

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# Section 4: Challenges Facing Teachers in the Application of Assistive Technological devices

1. Is there any challenge in the application of Assistive Technological devices on enhancing student academic performance for learners with hearing impairments?

A. Yes [ ] B. No [ ]

9. Name down the challenges for applying Assistive Technological devices to promote students' performance in public secondary schools?

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# Section 5: Strategies for Management of Assistive Devices and performance students with hearing impairment

Please put a tick (√) in the appropriate box to show the extent of your agreement or disagreement on the possible strategies for the effective Management of Assistive Technological devices to enhance performance for learners with hearing impairments in public secondary schools. The scales are SD= strongly disagree, D=disagree, M= Moderate, A= agree and SA= strongly agree.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No | Strategies for management of large class size | SD | D | M | A | SA |
| 1 | Provision of Adequate Assistive Technological  devices |  |  |  |  |  |
| 2 | Training Teachers on the Application of AT devices |  |  |  |  |  |
| 3 | Promoting professional development for AT to the  teachers |  |  |  |  |  |
| 4 | Training students on Appropriate use of AT devices |  |  |  |  |  |
| 5 | Raising awareness to school Administrators on the  use of AT |  |  |  |  |  |

11. In your opinion, what should be done to ensure effective management of AT devices to enhance student academic performance for learners with hearing impairments in public secondary schools in Arusha City in Tanzania?

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**APPENDIX II: Questionnaires for students**

Introduction Dear Students,

My name is Isaack Pascal, a student at the Open University of Tanzania pursuing a Master of Education Administration, Planning and Policy Studies. I am carrying out research with the title Enhancing the Academic Performance Of Students With Hearing Impairments Through The Management Of Assistive Technologies: A Case Study In Arusha City Council In Tanzania". The purpose of this questionnaire is to find out the application of AT and academic performance for learners with hearing loss in public secondary schools. This research is a part of the requirements of the Master of Education Management, Planning and Policy Studies. I would like to ask for your consent to participate in this research knowing that the information that you provided will be treated confidentially and not be disclosed to any person.

# Consent Declaration

I have read and understand the information above and procedures pertaining to this interview for research purpose. I also understand that by signing this letter, I have agreed to participate in this study with consent and willing to provide the required data voluntary.

# Signature

**Date**

# Section 1: Demographic Information

Instructions

Please respond to the following questions by putting a tick in the box [√] and where an explanation is required fill in the spaces provided.

1. What is your age?
   1. 14 years and below [ ], B. 15-16 [ ], C. 17-18 years [ ], D. 19 years and above [ **]**
2. What is your gender?

A. Male [ ], B. Female [ ].

1. What is your class?
   1. Form one [ ], B. Form two [ ], C. Form three [ ], D. form four [ ]
2. What is your specialized subjects?
   1. Arts [ ], B. Science [ ], C. Business studies D. technical education [ ]
3. Do you have training with teacher of special needs education? A. Yes . B. No

# Section 2: Types of Assistive Technological devices in Secondary Schools.

1. Do you have Assistive technological devices to assists you in your school? A. Yes [ ], B. No [ ].
2. Outline types of Assistive Technological devices for Learners with hearing loss found in your School.

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1. Do students with hearing loss use the Assistive Technological devices during teaching and learning process. A. Yes [ ] B. No [ ]
2. Outline types of Assistive Technological devices used by learners with hearing loss in the learning process in your school.

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**Section 3: Effective Management of Assistive Technological Devices**

1. Do you think Assistive technological devices are used effectively in your school.

A. yes. B. No

1. Briefly explain how Assistive Technological devices are used effectively to promote performance for learners with hearing loss

# …………………………………………………………………………………………

**…………………………………………………………………………………………**

# ………………………………………………………………………………………… Section 4: Challenges Facing Teachers in the Application of Assistive Technological devices

1. Is there any challenge in the application of Assistive Technological devices on enhancing student academic performance for learners with hearing loss?

A. Yes [ ] B. No [ ]

9. Name down the challenges for applying Assistive Technological devices to promote students' performance in public secondary schools?

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# Section 5: Strategies for Management of Assistive Devices and performance students with hearing impairment

Please put a tick (√) in the appropriate box to show the extent of your agreement or disagreement on the possible strategies for the effective Management of Assistive Technological devices to enhance performance for learners with hearing loss in public secondary schools. The scales are SD= strongly disagree, D=disagree, M= Moderate, A= agree and SA= strongly agree.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No |  | SD | D | M | A | SA |
| 1 | Provision of Adequate Assistive Technological  devices |  |  |  |  |  |
| 2 | Training Teachers on the Application of AT devices |  |  |  |  |  |
| 3 | Promoting professional development for AT to the  teachers |  |  |  |  |  |
| 4 | Training students on Appropriate use of AT devices |  |  |  |  |  |
| 5 | Raising awareness to school Administrators on the  use of AT |  |  |  |  |  |

1. In your opinion, what should be done to ensure effective management of AT devices to enhance student academic performance for learners with hearing loss in public secondary schools in Arusha City in Tanzania?

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# Thank you for your participation

**Appendix III: Interview Guide Questions for School heads Introduction**

Dear Participant,

My name is Isaack Pascal, a student at the Open University of Tanzania pursuing a Master of Education Administration Planning and Public Policy. I am carrying out research with the title Enhancing The Academic Performance Of Students With Hearing Impairments Through The Management Of Assistive Technologies: A Case Study In Arusha City Council In Tanzania". The purpose of this interview is to find out the application of AT and academic performance for learners with hearing impairments in public secondary schools. This research is a part of the requirements of the Master's Degree in Education Management and Planning. I would like to ask for your consent to participate in this interview knowing that the information provided will be treated confidentially and not be disclosed to any person.

Duration of Interview will be 40 minutes Date…………………………..

# Consent Declaration

I have read and understood the information above and procedures pertaining to this interview for research purpose. I also understand that by signing this consent letter, I have agreed to participate in this study with consent and willing to provide the required data voluntarily.

Signature……………………………. Date ……………………………………

# Interview Guide Questions

Please respond to the following questions

* 1. What are the assistive technological devices used to enhance performance of learners with hearing impairments at your school?
  2. To what extent effective management of assistive technological devices affects the performance of learners with hearing impairments?
  3. What are the challenges experienced by teachers in managing effectively technological devices to enhance performance for learners with hearing impairments?
  4. In your opinion, what should be done in schools to ensure effective management of technological devices to promote the performance for learners with hearing impairments?

# Thank you for your participation