# INTEGRATION OF ADAPTIVE TECHNOLOGY IN INSTRUCTION OF VISUALLY IMPAIRED STUDENT TEACHERS IN SELECTED PRIMARY TEACHER TRAINING COLLEGES IN KENYA

BY

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# DECLARATION

## Declaration by the candidate

I hereby declare that this thesis is my original work and has not been presented for a degree in any other University. No part of this thesis may be reproduced without prior permission of the author and/or Moi University.

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## DEDICATION

This work is dedicated to my husband, Mr. Philip Kipchirchir Tuimur, my children, Ian Kiprop, Evelyn Cheptoo and Sharon Chepkemboi, you are my motivation for every decision I make in life.

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## ABSTRACT

Integration of Adaptive technology improves the quality of education and removes learning barriers for the Visually Impaired learners. For the visually impaired student teachers to graduate as skilled, confident and competent primary school teachers, tutors should modify and adjust materials of learning so that they can access the curriculum content adequately. This study assessed integration of adaptive technology in instruction

of visually impaired student teachers in primary teachers training colleges (TTCs) in Kenya. It sought to establish the types of available and used adaptive technology devices for visually impaired student teachers, tutor training on integration of adaptive technology for visually impaired student teachers and tutors' attitudes and visually impaired student teachers' perceptions on integration of adaptive technology. It also examined the college administration's support in the integration of adaptive technology for visually impaired student teachers. The study was based on the diffusion of innovation theory by Rogers which gives a basis for adoption of innovations in institutions and other settings. The study adopted descriptive survey research design. The study population included administrators, tutors and visually impaired student teachers in three primary teachers training colleges which admit student teachers with visual impairment in Kenya. Purposive sampling technique was used to select three deans of curriculum while Simple random sampling was used to select nine heads of departments and 93 tutors. Census was used to select 41 visually impaired student teachers (blind and low vision) making a sample of 146 respondents. The instruments used for data collection were questionnaire, interview schedule, and observation checklist. Descriptive statistics such as frequencies and percentages were used to analyze the quantitative data. Qualitative procedure was applied to information from interviews where respondents answers were presented in words and interpretations made. The findings of this study revealed among other things that, adaptive technology devices for visually impaired student teachers were insufficient, tutor training on integration of adaptive technology was lacking, the college administration support in the integration of adaptive technology was poor and the tutors viewed integration of adaptive technology as valuable but lacking. The visually impaired student teachers' perception on integration of adaptive technology in primary teacher colleges in Kenya was that; adaptive technology devices were inadequate and hardly used by tutors. The following recommendations were made; adaptive technology devices for visually impaired student teachers should be provided and tutors should be trained on integration of adaptive technology. The college administration of public primary TTCs should fully support the integration of adaptive technology for VI Student teachers in the primary TTCs by buying resources and training tutors on integration of adaptive technology.

## TABLE OF CONTENTS

# LIST OF TABLES

**LIST OF FIGURES**

**ABBREVIATIONS AND ACRONYMS**

ATD            Adaptive Technology Devices

DDA            Disability Discrimination Act

GoK          Government of Kenya

KICD            Kenya Institute of Curriculum Development

KISE            Kenya Institute of Special Education

MoE          Ministry of Education

MoEST        Ministry of Education, Science and Technology

PTE            Primary Teacher Education

TTC          Teacher Training College

SPSS            Statistical Package for Social Sciences

UN            United Nations

UNESCO      United Nations Education, Science and Cultural Organization

UNICEF        United Nations Children's Educational Fund

VI            Visually Impaired

## CHAPTER ONE:   BACKGROUND OF THE STUDY

**1.1 Introduction**

The goal of education is to provide equal opportunities for all persons including those with special needs (RoK, 2009). Kenya is one of the 92 nations of the world who originally signed the Salamanca statement and framework for action on special needs education (1994), where it was agreed that regular schools should admit all persons irrespective of their physical, social and mental conditions. This was in a bid to ensure that all accessed quality education. This is also echoed in the world declaration on Education For All in 1990 (UNESCO, 1990), the UN standard rules on the equalization for persons with disabilities in 1993(UN, 1994) and the Dakar framework for action in 2000 (UNESCO, 2000). Millennium Development Goals endorsed at the UN millennium Development Summit in 2002 targeted the eradication of extreme poverty and hunger and the achievement of Universal Primary Education (UPE) as its first two goals. The education goals of the vision 2030 also consider this by providing globally competitive quality education, and among other things integrate special needs education into learning and training institutions. Inclusive education is about both getting children into and through school by developing schools that are responsive to the actual, diverse needs of children and communities.

According to the 2005 Sessional Paper No.1, the government of Kenya would integrate special education programmes in all learning and training institutions and ensure that the institutions are responsive to the education of learners with special needs. Special education programmes are designed to meet the unique needs of children with special education needs which includes classroom instruction (Republic of Kenya, 1999).

Learners receiving special education have educational handicaps like physical, hearing, visual, mental, emotional, language, and multiple handicaps. These handicaps interfere with regular learning unless modifications and related services, equipment and specially trained teachers are provided (Republic of Kenya, 1999). According to the national policy for persons with disabilities in Kenya, technology remains largely inaccessible to persons with disabilities in terms of affordability, design and training for its use. Electronic, print media and other modes of communication are generally inaccessible to people with visual, hearing or intellectual disabilities. This prevents them from participating or benefiting from information in these channels. To overcome these communication barriers, it is imperative to introduce modes accessible by persons with impairments. These include; brailing of printed information, sign language interpretation, eye-catching simplified messages, well-illustrated and easily repeatable information. These should be delivered in accessible public settings ( RoK , 2015).

Visually impaired (VI) students have difficulty in grasping concepts like distance, size, shape, and thus they require different methods and more time to learn concepts. They also find gathering of information very difficult. Research has shown that performance by special needs students often lag behind other students in learning institutions (Mugo, 2008). Total loss of vision has three main limitations; lack of variety and range of experiences, lack of mobility thus limiting the amount of knowledge to be acquired from the environment and Interacting with the environment is a problem.

 This situation can be addressed with adaptive technology. Adaptive technology refers to any product, device, and equipment whether acquired commercially, modified or customized that is used to maintain, increase or improve the functional capabilities of individuals with disabilities (Bitter & Legacy, 2009). Students who are blind or visually

impaired will typically need adaptations to access printed information that will allow the student to access all areas of the curriculum. According to Willings (2015), it is the role of the Teacher of Students with Visual Impairments to determine the adaptations that the student needs. These will vary, depending on the degree of functional vision, effects of additional disabilities, and the task to be done. Students may use braille, large print, regular print, tactile symbols, a calendar system, sign language, and/or recorded materials to communicate. Some of the adaptive technology devices include; Braille, tactile maps and diagrams, print with the use of optical devices and screen readers among others. Categories of adaptive technology include: academic and learning aids, computer access and instruction; pre-vocational and vocational and vocational aids, and visual aids.

With Computer Access, there is a Keyboard with built in accessibility options on standard computer, touch screen; voice recognition software; switch and Morse code; switch with scanning; screen reader; or word prediction/abbreviated expansion. Adaptive technology devices improve access to quality education, enable the learner to address individual and collective temporary social problems and be able to reach responsible judgment in seeking solutions to these problems. They enhance the performance of a target skill, including cognitive processes, learning, communication, and physical abilities. Adaptive technology therefore improves the functionability of learners (Republic of South Africa, 2005). They improve the quality of education and remove barriers to learning. Teachers should modify and adjust materials of learning so that the VI learners can access the curriculum content adequately. This can be done by using them in their original form e.g. braille clocks and watches, materials manufactured specifically for visually impaired students may also be used. Real objects can also be modified by preparing models and tactile diagrams.

According to Disability Discrimination Act (DDA), inclusion of VI learners in mainstream education emphasizes that teachers have two main duties i.e. not to treat visually impaired learners less favourably than others for reasons related to his/her disability without justification. Secondly, make reasonable adjustments with regard to learning aids to ensure that visually impaired learners are not placed at a substantial disadvantage.

School and classroom environmental adaptations can help the student who is blind or visually impaired move safely and efficiently through their environment. A student's need for adaptations to the environment depends on their visual impairment and any additional disabilities. It is important to understand each student's visual diagnosis and the implications with regard to functional vision to make the appropriate adaptations in order to maximize the student's use of vision (Willings 2015).

Special considerations for students who are visually impaired should be made. These include providing, Braille Signs, A lunchroom, Fire Drills & Emergencies and Safety. In 1991, In the USA, the "Braille Bill" was passed into law by the Texas State Legislature.  One provision of the bill, contained in Chapter 506, states that: "each person assisting in the development of a functionally blind student's individualized education program shall receive information describing the benefits of Braille instruction." Braille instruction benefits students who are functionally blind in the following ways: Braille allows reading and writing skills to be developed and because literacy is based on the ability to read and write, Braille is the only media available for obtaining literacy for people who use their tactile sense as the primary means of gathering information. Braille also allows the student who is functionally blind to have the same "written" materials in

the classroom as sighted peers which allows for instruction in correct written language usage such as structuring sentences, spelling, formatting paragraphs and editing. Braille allows the selection of a book for the pleasure of reading independently at any time or place without additional equipment.

Braille signs are helpful in buildings for the braille reader. Words in large print, and simple pictures, signs that are uniform and do not have visual clutter are beneficial to students with low vision as well as students with cognitive disabilities in general. All signs with any characters or numbers written on them must have a translation in braille. These Signs are required for classroom identification, restrooms and directional signage and at elevators. The room identification signs should be placed on the wall next to the latch to allow a person to read it easily.

Visually impaired students need special considerations in the lunchroom, which can be difficult to navigate. Orientation to the lunchroom is necessary so that the students with visual impairment can learn among other things, where trays are located and where lines form. Peers or staff members should give the visually impaired students physical assistance or verbal directions to get empty seats until the students develop a routine. The cafeteria staff may remind the student about the day's food selections. The highest level of independence possible for each visually impaired student should be encouraged.

With regard to fire drills, the visually impaired student may not be able to access diagrams posted near doors. The Orientation and Mobility Specialist (O&M) may work with the student on learning routes from the classroom and from other locations in the building, ideally in advance. During an emergency, the visually impaired student should be instructed to take hold of the nearest moving adult quickly and quietly follow others.

Sharp corners on furniture throughout the building should be covered to prevent injuries if a visually impaired student bumps into the edge. Edge and corner protectors may also be purchased or cut foam pipe covers or pool noodles to cover them. Furniture should be stable and not easily knocked over if a visually impaired student runs into it. Rug edges should be secured to the floor to prevent slips/trips while overhangs like upper cabinet doors, things hanging from the ceiling, fire extinguishers, drinking fountains, phone booths, and sinks on pedestals should be avoided. Doors should fully open or firmly shut since a visually impaired student may walk into the edge of a half-open door or trap their fingers in the hinge while feeling their way around. A doorstop or door wedge may be used to keep the door in a fully open position. Electrical outlets should be covered and electrical cords taped down on the floor to prevent trips or falls. Students should be encouraged to put toys and belongings away when they are done playing with them to avoid clutter being scattered around the floor and in the hallways. Visual adaptations such as painting color-contrasting strips on stairs and tactual cues such as non-slip mats, adhesive tread strips or different type of flooring by stairs should be used.

According to Willings (2015), some considerations should be made when arranging the classroom to accommodate a visually impaired student. The classroom can be rearranged but not too frequently, because the student will need to be oriented. The visually impaired student should be placed with other students. An organized classroom reduces visual clutter, promotes independence in navigation, and helps the visually impaired student independently locate and clean up materials. The design of the classroom can also be viewed as a tool to modify behaviors. There should be control of the environmental conditions such as lighting, color, placement, spacing, contrast, size, detail, etc. This will

help ensure that the visually impaired student has adaptations necessary to be successful and as independent as possible.

A well-organized classroom should be free of visual and physical clutter. Excessive furniture, materials and equipment, should be avoided. The activity areas should be well defined.

The furniture should provide clear traffic paths that are safe and accessible to help develop orientation and mobility skills for visually impaired students. There should be enough space for wheelchairs, standers and other specialized equipment to be moved. The furniture should enhances their freedom of movement.

Willings (2017) explains that considerations should be made when adapting labels and signs throughout the classroom in order to make them accessible to students who are visually impaired. When labeling materials in the room, it is important to use a labeling system that is accessible to all the students. The labels need to be in a variety of formats: print, braille, pictures, and even objects. This will help students locate materials and put them away correctly. Incorporating print and/or braille for non-readers and pre-readers will also help promote literacy. Labeling can help create an organized and accessible room that will encourage independence.

Signs should be placed in strategic locations for the student's observation and exploration. Important landmarks should be labeled. Objects should be labeled print and braille. Magnetic labels can be used to create reusable large print or braille labels that can be attached to canned goods or other magnetic surfaces. Hand-held digital voice recorder with each recorded message keyed to an adhesive label or plastic disk tag can be attached

to books, documents, CD's or any other item that needs to be identified. The Reizen talking label identifier also allows the user to program and read buttons.

Students with visual impairments need adjustments to the lighting to minimize the negative impact of their visual impairment. Depending on the student's visual needs, the student may need additional lighting or reduced lighting. The ideal situation is for light to be distributed on the visual task in equal amounts from all angles and reduced glare from windows and lights. Shiny surfaces on pages, desks, and blackboards should be avoided while shiny tabletops with light-absorbing materials should be covered. Avoid a glossy finish since it can lessen legibility and can produce glare. Task lighting can be used for students who need higher levels of lighting to see best, lighting should be of sufficient clarity to enable the student to see materials and to perform the necessary visual tasks in the most comfortable visual environment. Lighting may need to be increased or decreased depending on the student's visual needs. Fluorescent lighting may be used since it has several advantages. It disperses light evenly over a wide area, produces fewer glare spots due to even lighting and light remains cool even at close distances. Incandescent Lighting, Full Spectrum and Halogen Lighting may be used depending on the lighting.

 The teacher should therefore help foster learners' ability to gain fully functional aesthetic access to their environment. The basic approach and orientation employed by the teacher of the visually impaired learner differs from those employed to educate the sighted. A mere description of situations, incidents or concepts does not necessarily give a comprehensive picture in the mind of visually impaired learners and more so VI student teachers. Adaptive technology devices like tactile diagrams, maps and graphics, greatly enhance the acquisition of the overall picture by the VI learners, as well as their

experiences. Large scale cross national studies in western countries provides extensive information on the best practice for inclusive education. All of the studies recommended that tutor training should focus on enskilling classroom teachers in areas of pedagogy, curriculum development and adaptation (Casey & Rakes, 2002; Peters, 2003 and Braslavsky, 2004). According to the national policy for persons with disabilities in Kenya, the government would facilitate the production and availability of quality, appropriate and affordable adaptive equipment and assistive devices. Retraining of teachers in regular schools would be scaled up to enable them teach children with special needs. There would be a conducive learning environment that takes care of special needs of children with disabilities in collaboration with stakeholders. Appropriate technologies, assistive devices and learning materials for persons with disabilities would be designed and developed. Special needs education in the regular teacher- training curriculum would be incorporated (RoK, 2015).

The gap in research encompasses integration of adaptive technology to support inclusive education. This study attempted to bridge this gap by assessing integration of adaptive technology in instruction of VI student teachers in primary teacher training colleges in Kenya and the attitudes of tutors and VI student teachers towards integration of adaptive technology.

## 1.2 Statement of the Problem

A dominant problem for the visually impaired is lack of access to education. This is due to inadequate capacity among many teachers to handle students with special needs, lack of coordinators among service providers, inadequate and expensive teaching/ learning materials among others (MOEST, 2005). In order to increase access and improve on

quality, the Kenya government has integrated special education programmes in pre-service teacher training in three primary teachers training colleges, which was the focus in this study with regard to integration of adaptive technology for visually impaired (VI) student teachers in instruction.

A (VI) student teacher has impairment of visual function, which cannot be improved by the use of corrective lenses to a level that would normally be acceptable for reading and therefore need adaptive technology. The student teacher may also be unable through physical disability, to focus or move his/her eyes to the extent that would normally be acceptable for visual reading. This situation can be addressed with adaptive technology, which improves the function ability of VI student teachers. Adaptive Technology refers to any product, device, and equipment whether acquired commercially, modified or customized that is used to maintain, increase or improve the functional capabilities of individuals with disabilities. Some of the adaptive technology devices used by low vision VI student teachers include; highlighters, which make the print more visible, stand-alone and hand held magnifiers and reading stands. They also require spectacles mounted on magnifiers, telescopes and screen readers. Exercise books should be boldly ruled and textbooks should have large prints. The totally blind student teachers obtain information through tactile and auditory media. They require Braille machines or slate and stylus, which are used when the Braille machine is not available, brailed textbooks, tactile maps and diagrams are also used. For the VI student teachers to graduate as skilled, confident andnm competent primary school teachers, tutors should modify and adjust materials of learning so that they can access the curriculum content adequately. The VI student teachers have been admitted in selected primary TTCs in Kenya and have been placed in

the same classes with the sighted student teachers. They are taught by the same tutors at the same time in the same class yet they use different learning materials.

According to the Koech report of 1999, majority of teachers of visually impaired students were said not to be proficient in Braille, the VI students relied on audio-taped books which were of poor quality (Republic of Kenya, 1999). During instruction in the primary TTCs, teaching and learning aids are very essential. An adapted syllabus for VI student teachers has been prepared to cater for their needs. The syllabus stresses that the teaching of student teachers who are visually impaired demands that tutors use appropriate resources and be competent in development and production of quality tactile diagrams and maps. The tutors should also posses positive attitudes towards teaching student teachers who are visually impaired. Successful and effective completion of the syllabus ensures that student teachers who are visually impaired are fully integrated into the teaching profession (KIE, 2005).

 For the visually impaired student teachers to be adequately catered for in instruction, adaptive technology should be integrated. This involves availability and use of adaptive technology devices for visually impaired student teachers and training of tutors on preparation and use of these devices. There is inadequate research on integration of adaptive technology in instruction in primary TTC, thus it is not clear what the situation is.  Inclusive Education has been introduced in primary TTCs and thus there is need for research in the area to ascertain the state of affairs. Evidence is necessary because without use of adaptive technology, visuall impaired student teachers will not be adequately prepared as primary school teachers. It is against this backdrop that the study

was carried out on integration of adaptive technology in instruction of VI student teachers in primary TTCs.

## 1.3 Purpose of the study

The purpose of the study was to assess the integration of adaptive technology for visually impaired student teachers in instruction in primary teacher training colleges in Kenya. This follows the line of thought that effective tutors should possess a wide range of competencies needed to provide quality-learning experiences to the visually impaired learners. The basis of this being inclusive education and the changing demands in our environment which call for adequate preparation of the tutors in use of adaptive technology for the visually impaired during instruction.

## 1.4 Objectives of the study

### 1.4.1   Main research Objective

To assess the integration of adaptive technology for visually impaired student teachers in instruction in primary teacher training colleges in Kenya.

### 1.4.2   Specific Research Objectives

The objectives of this study were to:

i)      Establish the types of available and used adaptive technology devices for visually impaired student teachers for integration in instruction in primary TTCs.

ii)     Determine competencies of tutors in the use of adaptive technology for visually impaired student teachers in instruction in primary TTCs.

iii)    Examine the tutors' attitudes towards integration of adaptive technology for visually impaired student teachers in instruction in primary TTCs.

iv)  Establish the visually impaired student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs.

v)  Examine the college administration's support in the integration of adaptive technology for visually impaired student teachers in instruction in primary TTCs.

## 1.5 Research Questions

The following research questions were used to guide the study:

**Main research question**

How is the integration of adaptive technology for visually impaired student teachers in instruction in primary teacher training colleges in Kenya?

**Subsidiary questions:**

i)  What types of adaptive technology devices for visually impaired student teachers are available and used for integration in instruction in primary TTCs?

ii)  What are the competencies of tutors in the use of adaptive technology for visually impaired student teachers in instruction in primary TTCs?

iii)  What are the attitudes of the tutors towards integration of adaptive technology for visually impaired student teachers in instruction in primary TTCs?

iv)  What are the perceptions of visually impaired student teachers on the integration of adaptive technologies in instruction in primary TTCs?

v)  What support is provided by the college administration in the integration of adaptive technology for visually impaired student teachers in instruction in primary TTCs?

## 1.6 Justification of the study

Through integration of adaptive technology in instruction of visually impaired (VI) student teachers, their challenges and special needs are met. Adaptive technology devices can make a measurable difference in VI student teachers' achievement, attitudes and interaction with tutors and other student teachers. A VI student teacher's motivation can be fully realized and thus be challenged positively. According to Gary & Mark (2007), full integration can be achieved only through functional integration where students with disabilities participate with their peers on an equal basis in educational programs. Purcell & Grant (2002) also add that Adaptive Technology gives students with special needs access to the curriculum. As a result of this, a VI student teacher is able to acquire the necessary skills, confidence and competence to teach in primary schools upon completion of the Primary Teacher Education course.

According to Berdine and Blackhurst(1985), greater integration of the visually impaired into classes with seeing children and more training about the capabilities of the visually impaired for regular classrooms teachers would result in improved attitudes towards the visually impaired and more appropriate educational planning and placement. These imply that when integration of technology is fully adopted, the visually impaired would be accepted more in the society and attain the desired profession like teaching. UNESCO (2005) asserts that well trained teachers have the potential to achieve social economic and cultural objectives thus helping the society to be better protected and served by its leaders equitably. With full integration of adaptive technology for visually impaired student teachers the teachers will be well trained since they will access the curriculum.

According to the Kenya Education Sector Support Programme (2005-2010), as a result of the recent changes in education, the curriculum delivery required continuous monitoring eg evaluation to ensure that it is effectively implemented (MOEST, 2005).Therefore

through this study, the status of integration of adaptive technology in instruction of the visually impaired would be established. Primary TTCs had admitted VI student teachers to study with sighted student teachers in the same classrooms. There was need to ascertain the integration of adaptive technology which would ensure that VI student teachers are adequately prepared as primary school teachers. The role of teachers in curriculum development and implementation includes provision of relevant information on the strengths and weaknesses of the existing curriculum and suggest areas of improvement. Thus it was relevant jmfor administrators, tutors and VI student teachers to give information for integration to be ascertained in this study.

## 1.7 Assumptions of the study

 The researcher would find institutions that are fully equipped with adaptive technology devices for visually impaired student teachers with tutors who have competencies that enable them instruct the visually impaired. That the researcher would find willing respondents who would be truthful in providing the answers to the questions provided. To find representative population that would be used to acquire data needed in answering questions of this study.

## 1.7 Limitations of the study

The study limited itself to the integration of adaptive technology for VI student teachers in the primary TTCs. The results may not be generalized to other levels of education like secondary and primary schools but the research findings revealed a lot about the

integration of adaptive technology for visually impaired students in learning institutions. Reviewed literature highlighted the status of integration in other levels of education.

The study was constrained by a few studies that have been done on the status of integration of adaptive technology devices for the visually impaired student teachers in Primary TTCs in Kenya. Due to this, the researcher utilized studies, which have been done outside Kenya, as well as those from other levels of education in Kenya.

Adaptive Technology infrastructure demands heavy investment and for this reason, the availability of devices may not be uniform and at the same time the devises are subject to breakage, which may force administrators to keep them under lock and key. For this reason, restriction to access when needed may compromise utilization of technology, which is a matter beyond tutors' control.

## 1.8 Significance of the study

The study was of significance in several ways. The study examined the available adaptive technology devices for VI student teachers used when teaching at the primary TTC, the shortcomings in these were identified and recommendations made so as to rectify them. This could be useful to Kenya Institute of Curriculum Development (KICD) since the institute conducts research and prepares instructional materials to support any syllabi including the preparation of learners' books, play materials, teachers' handbooks, manuals, charts, mass media programs and related materials, videos, audio cassettes, CDs and diskettes(Agumba et al 2009:76).

The attitudes of tutors towards adaptive technology devices for VI student teachers were studied and recommendations made on improvement of the tutors' attitudes in cases

where it may have been low. This could help primary TTC tutors identify their shortcomings and action to be taken. The study provided information on adaptive technology devices for VI student teachers to Kenya Institute of Special Education (KISE) whose function is to design, produce and maintain educational resources and adaptive devices for persons with special needs and disabilities.

## 1.9 Scope of the study

The study was conducted in the primary TTCs in Kenya which had integrated visually impaired (VI) students. These were Asumbi, Machakos and Mosoriot teachers training colleges. The respondents of the study were administrators, tutors and VI student teachers in the selected primary TTCs. The study focused on the availability of adaptive technology devices for VI student teachers, use of adaptive technology devices for VI student teachers by the tutors, tutor training on the integration of adaptive technology for VI student teachers, the tutors and VI student teachers' attitudes towards integration of adaptive technology and the administration's support in the integration of adaptive technology for VI student teachers. The instruments used for data collection in this study were questionnaires, interview schedule, focus group interviews and observations.

## 1.10    Theoretical Framework

The study was based on the diffusion of innovation theory by Rogers (2003) and by Gerlach and Elly's theory of systems approach to teaching and learning (1980). First, the diffusion of innovation theory by Rogers (2003) gives a basis for adoption of innovations in institutions and other settings. Adoption is the process through which an organization decides to acquire systems or technology while diffusion is the process in which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2003). According to Rogers' definition of diffusion, there are four

elements in the diffusion of innovation process. These elements include; innovation, communication channels, time, and a social system. Innovation is an idea, practice(s) or objects that is perceived as new by individuals or a group of adopters. Communication Channels are the means by which innovations move from one individual to another or group to group. Time is the non-spatial interval through which the diffusion events occur. A Social System is a set of interrelated units that are engaged in joint problem solving activities to accomplish a goal or goals. Each element affects the rate of adoption of innovations. Rogers (1995) proposes five variables which affect the adoption rate of any particular innovation which include perceived attributes of innovations, type of innovation-decision, communication channels, and nature of the social system and extent of change agents' promotion efforts.

This model helped the researcher consider the factors which affected integration of adaptive technology devices in instruction for visually impaired (VI) student teachers. From the five variables which affect adoption as per Rogers (2003), perceived attributes of innovations, nature of the social system and extent of change agents' promotion efforts informed this study. According to Rogers (2003) the perceived attributes of Innovations include relative advantage, compatibility, complexity, trial ability and observability. Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes (e.g., economic profitability, saving of time when teaching the visually impaired student teachers and immediacy of reward).Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters (e.g. socio-cultural values and beliefs, previously introduced ideas, or visually impaired student teachers needs for adaptive technology devices). While complexity is the degree to which an innovation is perceived as relatively difficult to understand and use. E.g. use of adaptive technology devices for

visually impaired student teachers by tutors. Trialability is the degree to which an innovation may be experimented with on a limited basis while observability is the degree to which the results of an innovation are visible to others.

With regard to the nature of a Social System, Rogers (2003) explains that a social system is a set of interrelated units engaged in joint problem solving to accomplish a common goal. The social and communication structure of a system can facilitate or impede the diffusion of innovations in the system, for example, provision of adaptive technology devices for visually impaired student teachers and training of tutors on adaptive technology devices can enable integration of adaptive technology in instruction. In this study, the social system is the primary teachers training colleges (TTC) where VI student teachers have been admitted alongside sighted ones.

The extent of change agents' promotion efforts is another variable which affects adoption rate of any particular innovation according to Rogers (2003).Individuals within organizations who work to promote a specific innovation are change agents. There exits a relationship between the rate of adoption and change agents' efforts and a greater payoff from a given amount of change agent activity occurs at certain stages in an innovation's diffusion. (Rogers,2003). In this study, the primary TTC administration and individual tutors are regarded as the change agents, while adaptive technology adoption is the focus. Secondly this study was informed by Gerlach and Elly's theory of systems approach to teaching and learning (1980) as cited in Mwaka, Nabwire and Musamas (2014). A system is a group or collection of interacting and related units, element or entities that have central interest and work towards the achievement of a common goal or purpose (Mwaka etal, 2014). In this study, the instructional process in the Primary TTCs was taken to be a system comprising of the interactions by various persons and conditions. The persons

included the tutors and the VI student teachers while the conditions were the available resources or materials to be used in the implementation process. Gerlach and Elly (1980) outline various elements of a teaching and learning system thus: specification of objectives, selection of content, assessment of learners' entry behaviour, selection of teaching strategies and methods, selection of resources, allocation of time, organization of the learning environment, evaluation of learners and analysis of feedback. The systems theory was used to investigate the integration of adaptive technology devices for VI student teachers in the instructional process in primary TTCs in Kenya. Resources form a basic element in teaching and learning as per the systems theory.

## 1.11    Conceptual framework

According to Orodho (2009), a conceptual framework is a diagrammatic representation of variables or theories, illustrating and explaining their interrelationships. The researcher used the following conceptual framework to conceptualize the relationship between variables.

The study recognizes that education is key in social and economic development of a country. In Teacher Education, certain objectives that will make it possible for knowledge, skill and attitude to be attained by student teachers including the visualy impaired have to be met. The achievement of these objectives depends on how programs are designed accompanied by the aptitude and competence of the personnel, which is guided by the need to provide quality education where individuals are equipped with necessary skills in diversified ways. The success of the integration of adaptive technologies rests on the relationship between the following four components: availability of resources, tutor training and perceptions and support from the institutions administration. The figure provided therefore illustrates a dynamic and interactive

relationship between and among various components, which are interrelated, and which influence the adoption of Adaptive Technology in instructional process for the visually impaired. This includes; types of adaptive technologies, competency of tutors, perceived attributes and institutional support. Adoption of technology in daily practice is determined by interactive relationship of the above, which affects attainment of providing quality education for the visually impaired student teachers.

**Nature of the social system**
Administrative, availability of infrastructure, access, training, technical skills, availability of adaptive technologies

**Perceived attributes**
Relative advantage, compatibility, compatibility, Triability and observability

**Integration of Adaptive Technology**

**Extent of change agents promotion efforts**
Motivation by administration, provision of a conducive environment for learning, Up grading of tutors' skills, provision of adaptive technology devices

Development of new Innovations and adaptive Technologies

*Figure 1: Conceptual framework for the study*

**1.12    Operational definition of terms**

**Adaptive Technology -**It refers to any product, device, and equipment whether acquired commercially, modified or customized that is used to maintain, increase or improve the functional capabilities of individuals with disabilities. The adaptive technology devices are used in order to help the visually impaired access the curriculum (Purcell & Grant, 2002). In the context of this study, adaptive technology referred to devices used by VI student teachers in primary TTCs in instruction like highlighters, magnifiers, telescopes and screen readers which make the print more visible for low vision student teachers. Braille machines or slate and stylus which are used when the Braille machine is not available, brailed textbooks, tactile maps and diagrams are used by the totally blind students.

**Attitudes**-It is defined as positive or negative feelings associated with performing a specific behaviour (Samak, 2006). In this study, it was used to refer to opinions held by tutors about adaptive technology for VI student teachers in instruction in primary TTC. Negative attitudes was used in the study to refer to statements of dislike by tutors and lack of confidence in using adaptive technology for VI student teachers in instruction in primary TTC. Positive attitudes referred to affirmative statements by tutors, preference and confidence in the use of adaptive technology for VI student teachers in instruction.

**College administration support;** According to Longman Dictionary of Contemporary English (2005), a college is a school for advanced education especially in a particular profession or skill e.g. a teacher training college. Administration refers to people who carry out activities that are involved in managing the work of a company or organization

while support is approval, encouragement and perhaps helps for a person, idea, plan among others. In this study, College administration support referred to provision of adaptive technology devices, facilitation of the training of tutors on integration of technology and ensuring that the VI student teachers learn in a conducive environment by Primary TTC administration.

**Inclusive Education;** This is an approach in which learners with special needs are provided with education within regular schools (Too, 2011). In this study, inclusive education referred to the admission of visually impaired student teachers in the selected primary teachers training colleges.

**Instruction;** It is the transfer of learning from one person to another. It is the activities that will impart knowledge or skill (Longman, 2005). In the study, instruction referred to the act of teaching of the student teachers by the tutors at the selected primary teachers training colleges.

**Integration-**According to the Longman Dictionary of Contemporary English (2005), integration is the combining of two or more things so that they work together effectively. Integration also means to put more than one thing together or combine several things or issues  (Agumba et al 2009:170) In this study it was used to refer to the use of adaptive technology devices by the tutors to enhance learning of the content by visually impaired (VI) student teachers in instruction in primary teacher training colleges (TTC) in Kenya.

**Perception** According to the Longman Dictionary of Contemporary English (2005:1219), perception is the way you think about something and your idea of what it is like. In the context of this study it referred to VI student teachers' thoughts and ideas on availability and use of adaptive technology devices for VI student teachers and College

administration's support in the integration of adaptive technology for VI student training in Primary TTC.

**Tutor Training;** A tutor is a teacher in a university or college while training is the process of teaching or being taught the skills for a particular job or activity (Longman, 2005). In this study, tutor training referred to training of tutors on the preparation and use of adaptive technology for VI student teachers in instruction in primary TTCs.

**Visually Impaired Student teachers**; A visually impaired person is unable to see normally while a student teacher is someone who is learning to be a teacher (Longman,2005).A visually impaired student teacher has impairment of visual function which cannot be improved by the use of corrective lenses to a level that would normally be acceptable for reading. Those with low vision can read large print books or with the aid of a magnifying glass (Agumba et al 2009). In this study it referred to VI student teachers admitted in primary TTCs in Kenya which includes the blind and the low vision students**.**

**1.14 Chapter Summary**

Chapter one begun with a background to the study where the importance of provision of equal education opportunities for all persons including those with special needs is highlighted. The statement of the problem is also presented where the researcher echoes what has been asserted by others that the there has been lack of integration of adaptive technology for visually impaired (VI) student teachers. This is due to inadequate capacity among many teachers to handle persons with special needs, lack of coordination among service providers, inadequate and expensive teaching/ learning materials among others. Majority of teachers of visually impaired learners were said not to be proficient in Braille, the visually impaired students relied on audio-taped books which were of poor quality. The purpose of the study is also presented which was to asses integration of

adaptive technology for VI student teachers in instruction in primary TTC. The chapter also outlines the research questions, and the objectives of the study which are in line with the purpose of the study. The scope, limitations and assumptions of the study are also highlighted. The theoretical framework is also presented where the researcher based the study on the Diffusion of Innovation theory. Rogers (1995) proposes five variables which affect the adoption rate of any particular innovation. These include perceived attributes of innovations, nature of the social system and extent of change agents' promotion efforts. The chapter also presents the definition of terms as used in the study. The next chapter is a discussion of literature review in relation to the study.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

In this section the researcher reviews related literature from studies and researches in education, journals, books, thesis, and the internet. It is presented in several parts;

Teacher Education in Kenya, use of teaching/learning materials in instruction, Individual needs among learners in the classroom and Adaptation of teaching/learning materials to meet individual needs of learners. Special needs education in Kenya, Integration of adaptive technology for visually impaired student teachers  in instruction, adaptive technology devices for visually impaired student teachers , tutor training on integration of adaptive technology for visually impaired student teachers ,the tutors and VI student teachers attitudes towards integration of adaptive technology for visually impaired student teachers in instruction and the college administration's support in integration of adaptive technology for visually impaired student teachers and researches done on related studies.

## 2.2 Teacher Education in Kenya

 The Kenya Vision 2030 recognizes education and training in the social pillar. Teachers are an important component of education whose services are indispensable the world over. According to Farrant (2009), teaching is a profession that has to do with equipping young people for life and influencing change in society thus, teachers require effective and sufficient education to be able to adequately carry out their roles and responsibilities. There are variations of teacher education programmes for the different levels of education from early childhood to university education in Kenya. Teacher education encompasses pre-service and in-service teacher education programmes. These forms of teacher education programmes involve the study of professional disciplines and teaching subjects. According to Kafu (2003), teacher education is ostensibly designed, developed and administered to produce schoolteachers for the established system of education. It is the process of teaching and learning the skills needed to become a teacher. Loughran (2006) sees teacher education as the pre-service and in-service teacher preparation where students seek to develop knowledge and skills of teaching and apply these in practice. Pre

service follows a designed formal training mode of delivery where formal training is given to trainees (Nafukho, 2002).

Farrant (2009) further adds that pre-service is given before the teacher begins to teach while in service training is given as needs arise throughout the teachers' career. The Ministry of Education first launched in-service courses for untrained primary teachers through distance teaching in 1969. The program continued until 1977, when it was suspended, and revived in 1982 (Kinyanjui, 1998).

Before independence, for one to become a teacher in Kenya, one had to school for only eight years. When the education system changed from 4-4 to 7-4-2-3, there was then need for more training institutions. Courses were taught in English and the media and methods employed were printed text and radio broadcasts. Candidates were awarded the Certificate of Primary Teacher Education only when they had successfully completed three full years of the prescribed course of study.

In primary teacher education today, the student teachers undergo a two-year pre-service course, which leads to the award of primary teacher education certificate. The entry requirement for P1 Course is a minimum of C (Plain) in KCSE or its equivalent and must have attained D (Plain) in mathematics and C- in English. The visually impaired student teachers are admitted at a lower grade of c-. At the moment, there are 26 public primary teacher training colleges (TTC) and 68 private. While addressing education officials, college principals and other stakeholders during the launch of 2012 Primary TTC's selection exercise, Education secretary said that affirmative action had enabled the Ministry of Education to admit student teachers with special needs to learn alongside

other student teachers. The ministry had admitted 42 student teachers who were either totally deaf or blind (Internet, 13 April, 2013).

The primary teacher education curriculum  was first introduced in 1886 and later revised in 1994.It was revised next in 2004 after the revision of the primary school curriculum. (MOEST 2005).The curriculum contains ten subjects in the first year of study. In the second year, the students study nine subjects, five (5) core subjects and four (4) elective subjects from either the humanities or science categories to allow for specialization. The five core subjects are English, Kiswahili, Education, Health and Physical education, and information communication technology (ICT) and each student is required to choose four subjects from either option A or B. Option A subjects include Science, Home Science, Agriculture and Mathematics while option B subjects include Music, Art and Craft, Social Studies and Christian Religious Studies or Islamic Religious Studies (MOEST, 2001).

One of the objectives of teacher education under the 8.4.4 system is to develop in the student teacher awareness and appreciation of innovation in the field of education and to utilize them. Chemwei (2013) asserts that teacher education equips student teachers with necessary knowledge, skills and attitudes needed to enable them perform their duties competently. He further explains that it increases the knowledge base and broad understanding of the subject matter, provides deeper understanding of pupils and improves on instructional skills. Thus it is important that the primary teacher training programme is restructured to enable the student teachers acquire sufficient subject mastery and pedagogy (MOEST, 2001). Primary TTCs should also be equipped with the necessary teaching and learning materials and aids (Abenga, 2005).  A well-trained student teacher will be a confident teacher who looks forward to going to class.

**2.3 Use of Teaching/Learning Materials in Instruction**

Curriculum implementation effort cannot succeed without sufficient resources or materials (Carl, 2012; Syomwene, 2017). According to (Mwaka et al, 2014), teaching and learning materials are objects intended to be used during the processes of teaching and learning; when studying specific topics and achieving specific educational goals defined in syllabuses. They are used to simplify the content being taught. Educational materials are prepared materials intended to be used during the processes of teaching and learning; when studying specific topics and achieving specific educational goals defined in syllabuses. According to Agumba et al (2009:246), teaching/learning materials can be categorized into;

a) Display boards for instance chalkboard, flannel board and bulletin board.

b) Three-dimensional materials like objects, models, specimen, mobile sculpture, diorama, sand table, salt maps and globes.

c) Graphic materials like charts, graphs, maps, posters, collage, diagrams, pictures, and illustrations.

d) Electronic resources like radio, television, tape recorder, record player, opaque projector, overhead projector, slide projector, filmstrips, and computers.

e) Printed materials like books, workbooks and programmed instructional materials.

f) Community resources like people, regalia and local environment.

They are indispensable in the teaching process, since they are an important source for students. According to Braslavsky (2004);

a) Learning materials should make sense for the users. This means that they should be new, interesting, and enjoyable when using them.

b) Resources should be   mobilized.

c) Learning materials should be understandable and attractive for learners.

d) Learning materials have to promote, as far as possible, interaction between students and educators.

The selection of educational materials is influenced by educational goals, the content of the topic being taught, the developmental characteristics of learners and the availability of educational materials.

According to Mazgon and Stefanc (2012), Educational materials are among the key components of educational technology. This is because the teacher uses teaching materials during the teaching process as students use learning materials to acquire or revise their knowledge. Educational materials should help the teacher in carrying out the teaching process and students with their independent learning. Teaching and learning resources are incorporated into the lesson to enhance learner achievement in the instructional process. They occupy an integral place in the instructional process and should thus be selected, prepared and used carefully in order to give the leaners maximum benefit. Due to the complexity of teaching and individual variation among students in a given class, the teacher must master a variety of perspectives and strategies and be flexible in their application. The knowledge will help the teacher prepare lessons that are suitable to particular students on the basis of their characteristics. Teaching learning materials are used to improve the quality of instruction. Agumba et al (2009), explain that uses of teaching and learning materials include;

    a) Help in making learning interesting and lively hence capture and sustain learner attention to the topic under investigation.

    b) Enables learners to retain a substantial part of what is being learnt thus remember the content for a long time.

c) Helps the learner to use several senses thus enable what is learnt to be more meaningful. This enables the teacher to cater for individual learner differences.

d) Motivates and stimulates learners' imagination and help minimize teacher monotony as they add variety to the instructional process.

e) Help the leaner develop desired attitude hence foster positive behaviour change.

f) Simplify difficult (abstract) ideas or concepts thus making learners understand them with ease.

g) Supplement the spoken word hence enable the teacher not to use a lot of energy and effort in explaining the entire aspects of content thus saves time.

h) Helps in consolidating what has been learned thus contributing in making learning real.

i) They stir imagination and thinking process of the leaner.

Each resource has its own strengths and weaknesses, and therefore resources are chosen to match specific learning problems and blended so that weaknesses in one are overcome by strengths of another (Koech 2011). Kilel (2012) asserts that teaching resources are a key component towards realization of quality teacher training.

## 2.4 Individual Needs among Learners in the Classroom

Individualized teaching is an approach, which focuses on the learner as a unique individual thus allowing one to learn in his or her way and a speed or pace that is convenient to him or her (Agumba et al 2009). In today's classroom, there is a mix of student interests, needs, learning styles, and cultural backgrounds. These students have multiple, diverse and changing needs that are shaped by the learning histories of the individual, cultural and socioeconomic factors and language backgrounds. According to *Learning Strategies, Supports, and Interventions,* in a typical classroom, there may be students who require differentiated instruction; adaptations to instruction and assessment,

additional supports, modifications as outlined in their Individual Education Plan and individualized programming outlined in their Individual Education Plan.

The teacher is not expected to provide very different programs to students; rather, the differences can be managed using a variety of approaches. These Students with individual needs have the right to access an inclusive curriculum that is broad, balanced and relevant and meets their individual needs.

The teacher should determine the best methods and materials to address students' needs within the unit or lesson being taught. According to Agumba et al (2009), the teacher should guide the learner and provide any necessary assistance e.g. ensuring all the relevant resources are availed. Teacher guidance is essential to their success. The teacher should make 'reasonable adjustments' to accommodate a student with disability. This adjustment is a measure or action taken to assist a student with disability to participate in education and training on the same basis as other students. It becomes reasonable if the student with disability, the teacher and other students are catered for during the lesson.

Meeting the individual needs of each student can be challenging for teachers but doing so prepares these students to become active, effective learners for life, eases stress on both teacher and student in the classroom and allows each student to approach the curriculum. Materials given are retained which improves the morale of students. When each leaners individual needs are identified, the student becomes a kind of partner in their teaching and there is a sense of personal, active engagement with the materials of learning. This leads to a more adaptive learning mentality that can better prepare students for future learning and careers.

According to Maheshwari (2014), each student is a unique individual with innate differences in intelligence, differences in social and economic background, variations in past learning experiences, and perhaps variations in the level of congruence between the learner and the curriculum. Therefore, individual differences should be catered for to narrow the gap between individuals and enable them to learn well. To address the needs of students, teachers should provide them with a variety of learning opportunities such as using diversified resources.

## 2.5 Adaptation of Teaching/Learning Materials to Meet Individual Needs of Learners

Adaptations are planned, personalized alterations in the way teachers provide instruction, the way a student demonstrates learning, and in the assessment of progress. Adaptations help students to achieve and to demonstrate the achievement of the expected learning outcomes of the curriculum. Whitney Rapp says in her book Universal Design for Learning in Action "An environment that is universally designed for learning includes everyone and prepares everyone to be inclusive and think inclusively. It shows students that everyone is different, everyone has strengths, and everyone has needs, and that is okay. It shows students there are multiple ways to be successful, multiple ways to solve problems, and multiple ways to learn from mistakes." Each of your learners needs to be successful which can be achieved by adapting and customizing aspects of class activities and lessons and offering multiple ways for students to learn and show what they know.

Adaptations are developed for individual students through planning by the teacher, student, parents and possibly other support personnel. Students are assessed according to

the learning outcomes of the national curriculum. There is need to adapt instructional resources to cater for learners with diverse needs (Agumba et al 2009).

According to Eredics (2016), accommodations and modifications are two types of adaptations that can remove barriers to learning. Accommodations make curriculum accessible by providing students with an equal opportunity to learn from the same material as his or her peers. They change the way students access learning. Teachers can create pathways for students to learn by altering the presentation, expected response, educational setting, and timing of a lesson. In contrast, modifications make curriculum possible by changing the learning outcomes of a lesson to suit the cognitive ability of the student. It includes using instructional strategies to breakdown curriculum like providing the student with a simplified version of lesson, expecting the student to master a reduced number or concepts or central themes, and/or providing the student with prompts. Neglecting to provide accommodations and modifications for a student can result in the unfair practice of penalizing a student for issues beyond his or her control. Therefore, educators need to Accommodations and/or modifications for students can be incorporated into daily lessons and activities through Co-teaching, which involves the collaboration of the classroom teacher and a learning specialist and gathering ideas, resources, and techniques for making accommodations and/or modifications.

An adapted program retains the outcomes of the prescribed curriculum and adjusts the instruction to address the special learning needs of the student. There is a variety of ways that educators can provide adaptations for an individual student. These include adaptations to the physical or social environment, materials and resources, the introduction of supportive equipment, presentations, testing, assessment procedures,

assignments projects, organizational support and the time required to achieve curriculum goals. *(Learning Strategies, Supports, and Interventions).* Differentiation is the process of modifying instruction to meet the needs of diverse learners, where each student has their own personalized instruction and materials. Teachers often have to differentiate in ways that allow them to still serve the needs of the majority of the class, while also supporting those who are ahead or behind the majority.

According to Boyd (2017), there are three ways to differentiate instruction: through changing the content (what is being taught), the process (how it is being taught), and the product (how students demonstrate learning). In a classroom situation, materials like textbooks are about content, lesson plans and charts are about process, while worksheets and tests are about the product. The teacher should be in a position to plan all these three to achieve the learning outcomes. In understanding how Children with Visual Impairments Learn, it is important to highlight the notion that educational goals for individuals with visual impairments should be essentially the same as for sighted students. Students with visual impairments require specific interventions and modification of their educational programming. They can learn, but the access of their visual senses is impaired therefore they require different ways to interact with information, relying on touch, taste, and hearing to gather information, (NICHCY, 2012).

Students with disabilities rely on specialized materials in order to meet their individual learning needs, and teachers are required to identify ways to alter their teaching in order to meet those individual learning needs. The enhancement of visual information and alternative forms of presenting visual information using auditory or tactual means are two widely used strategies that are effective to convey concepts to students with visual impairments. Researchers are now focusing on developing and evaluating this broad

approach. However, these strategies have been criticized because studies lack a comparative design (Douglas et al., 2009).

 Visually impaired students could also be made to touch and observe regalia from a close range while lettering on the chalkboard and other graphic materials should be bold (Agumba et al 2009). Materials should be adapted only to the extent necessary for efficient learning and regular materials can be used in conjunction with environment adaptations or low vision devices (Stratton, 1990).

When teachers modify instruction to accommodate special needs students, all students benefit from the good teaching practices (Bulloch, 2018). If the student has difficulty reading written material, the teacher can find a text written at lower level, provide highlighted material, rewrite the student's text, tape the student's text and allow a peer or parent to read text aloud to student.

If the student has, difficulty writing legibly, the teacher can use a format requiring little writing like multiple-choice and programmed material. Assignments requiring copying can be reduced or omitted. The learner may also use a tape recorder or a computer. Bulloch (2018) suggests that if the student has difficulty expressing himself in writing, then the teacher can use oral reports, Tape-recorded report and panel discussion.

Some of the strategies by Rachel Janney & Martha Snell's practical guide to *Modifying Schoolwork* can be used in any combination to best meet the needs of your individual learners. They include altering the methods and materials used by the teacher during the lesson. Learners are offered many different ways to engage with and absorb the content. For example: Incorporating more visuals to present content in different ways, such as

maps, pictures, drawings, objects, or videos, using graphic organizers to arrange key points in a way students can easily grasp and providing additional models or demonstrations for students who need extra support during the lesson. Learners can also be provided with differentiated reading materials based on their reading level and/or interests and enhanced texts in which key parts are highlighted, pictures or symbols are added, and/or text is enlarged.

According to Causton et.al. (2015), students should choose their writing instruments and paper sizes which can be a successful strategy which make leaners write for longer periods of time. Technology may be used to evaluate text and make it more accessible. For instance, tools in Microsoft Word can help make text more readable and accessible. Auto Summarize can summarize key points in your reading material, while Readability Statistics can count the number of words and paragraphs. It can also average the number of characters in a word or number of sentences in a paragraph, and calculate the readability of the text given to students (Berkeley and Barber, 2015). In order to eliminate distractions to improve focus, extraneous noises, people, or objects should be removed for students with disabilities to focus on important instructional cues. Avoid setting up equipment for activities beforehand, or keep the materials covered with a tarp until they are needed (Block, 2016). The leaner can also use text-to-speech functions, which are available in many word processing, programs and enables text to be read aloud. A teacher can make an on-the-spot adaptations toolkit. One can use sturdy, reusable container such as a clipboard storage case and assemble a toolkit for making creative adaptations. Items may include: peel-off address labels, sticky notes, lined paper, laminating sheets, index cards, colored cardstock, felt-tip markers, pencils, erasers, highlighters, pencil sharpener, three-hole punch, assorted paper clips and rubber

bands, small stapler, glue stick, tape, scissors, dice, and batteries. (Janney and Snell 2013).

According to Wistrom (2012), Educational Technology can be used which includes systematic instructional techniques, procedures for changing behavior and technological advances in equipment, media and learning resources. Electronic technologies such as television, radio, audio, and videotapes and computers have the capability to revolutionize the quality, productivity and availability of education for the students. The teacher should also supervise the allocation, organization and use of essential learning resources. This provides the opportunity for adaptations to be easily incorporated into the daily routine, including.

According to Hanna Dumont (2017), researchers have argued in favor of adaptive teaching, an approach that requires teachers to adapt their instruction on a continuous basis. In an adaptive classroom, students work on different tasks at the same time. Some may be working independently, while others are engaged in learning with their peers, and still the teacher is introducing others to new subject matter. The adaptive teachers are careful to determine what each student already knows, by engaging in informal teacher-student interactions, reviewing students' assignments or conducting assessments that are more formal.

In *guiding principles of concept development* by Carmen Willings, Students who are blind or visually impaired need specialized instruction in order understand concepts in a highly visual world. They should be taught through concrete and unifying experiences and learning by doing. With Concrete Experiences, it is important to provide interaction with actual objects first and then determine if the student can transfer that understanding

to a model or a raised line drawing. Do not assume that a student has had experiences even with what you think may be common objects. Learning by doing involves students participating in all the steps from the beginning to the end of a process.  If the student only completes one or a few of the steps, they may be unaware of all of the other steps that someone else completed. The student should move through the activity independently so they do not become dependent on others. Unifying Experiences involves teaching in thematic units, which can help a student make connections between and among the topics of instruction that are discussed. Units expand vocabulary, concepts, and skills beyond those, which can be experienced incidentally in daily routines or in isolation.

## 2.6.1 Special Needs Education in Kenya

Special needs are conditions or factors that hinder an individual's normal learning and development. This may include disabilities, social, emotional, health or political difficulties. Special needs education is education, which provides appropriate modification in curricula, teaching methods, and educational resources, medium of communication or the learning environment (Mwaura & Wanyera, 2008). A number of studies on the intelligence of the visually impaired have been undertaken and many indicate no significant differences between the intelligence of the visually impaired, and that of the sighted but they tend to lag behind in school because they have difficulties gathering information  (Berdine and Blackhurst, 1985).This may imply that the challenge is in the way information is acquired by the learner.

Special Needs Education is leaner centred, flexible and adjustable to individual needs and abilities. Traditionally, the general attitude for the visually impaired people in many societies had negative connotations. Ndinda, (2005) explains that there was a social stigma, an attribute which impedes their social and economic welfare, however, the landmark in changing the philosophy and practices towards such people in the society is engulfed in the Salamanca Declaration of 1994. According to the Salamanca Statement and Framework for Action on Special Needs Education, every child has a fundamental right to education and must be given the opportunity to achieve and maintain an acceptable level of learning. Those with special needs students must have access to regular schools, which should accommodate them within child centered pedagogy capable of meeting these needs (UNESCO, 1994). According to Crowther, Dyson & Millward, (2001, p. 86), students in special schools have limited exposure to developments in inclusive education. This is because they do not study alongside normal students. Their teachers are trained education teachers. Inclusive education is a process of reconceptualising values and beliefs so that the concept of diversity is cherished by all (Swart & Petipher, 2005, p. 8).

The main categories of learners with special needs include; sensory impairments, cognitive differences, and communication difficulties among others. Learners with sensory impairments are those with impaired sensory organs and they include hearing impairment, visual impairment, and deaf blindness. Berdine and Blackhurst (1985) assert that the goal of special education for the visually impaired is to reduce visual related handicaps to the greatest extent possible. This will ensure that they acquire the same information as normal students without any impairment.

An adaptive aid is special equipment that can help a learner overcome his or her impairment. Many adaptive aids can be made easily and cheaply from materials around you. There are several definitions for adaptive technology, and each one suggests a different emphasis depending on who is being assisted. The formal definition of adaptive technology comes from the Assistive Technology Act of 1998 of United States of America which that it is "Any item, piece of equipment or product system whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain or improve functional capabilities of individuals with disabilities" (Cook & Polgar, 2014, p. 2). This definition focuses on improving capabilities. According to Pearman (2008), adaptive technology refers to technology specially designed or adapted to enhance the functioning of individuals with disabilities. This means that there is a high level of technology. Use of keyboards, screen magnifiers, onscreen keyboards, optical character recognition, as well as, voice recognition are indicators of high-level technology (Pelgrum, 2001). In academic settings, adaptive technology according to Schoepp (2005) is any technological devices or tools, which assist learners with disabilities to access learning materials and carry out learning tasks effortlessly.

Adaptive technology, as used in special education, is technology that is required for students with disabilities to access or profit from learning and is not required for students who do not have disabilities. It helps reduce the barriers to learning caused by physical, sensory, cognitive, speech or learning disabilities by allowing students to perform tasks that would otherwise be difficult or impossible to do independently.

According to Willings (2018), Students who are blind or visually impaired have unique visual needs that need to be communicated to all team members during eligibility, at the beginning of each school year, and when there is any change in the student's unique

needs. These visual needs include; Visual Functioning, Board Presentation, Demonstration Lesson and Material Adaptations. Since visual performance may fluctuate due to changes in light, fatigue, or illness, the student needs extra time to process visual information and reduce visual fatigue. The student should be given copies of distance presentation activities to be viewed at his/her desk as needed. Information should be verbalized and of high contrast color. With regard to lesson demonstration, the student should be allowed to handle the materials before, during and after the demonstration. The student should also be able to move about the room as needed to see information presented away from his/her desk. Worksheets should be bold and of good copy quality. The student should use optical devices to access information at near and distance. Allow the student extra time to process visual information. When using a computer, the screen should be tilted to avoid glare and the Mouse pointer speeds may need to be slowed. The Mouse pointer may need to be enlarged and the computer screen may need magnified.

 Each student identified as having special needs must have an individualized program plan (IPP). An IPP is a written commitment of intent by the learning team to ensure appropriate planning for students with special needs. It is a working document and a record of student progress. Developing an IPP involves six interrelated stages including the following; Identifying needs, setting the direction, creating a plan, implementing the plan, reviewing and transition planning.

The visually impaired student should learn Braille. The teachers at the school should also learn Braille to be able to mark the student's work and exams. The visually impaired student should sit near the front so he/she can hear the teacher clearly. Another student can help by reading to him. Teachers should adapt teaching aids so that the visually

impaired student can feel them and understand. Everyone should touch the visually impaired student and say their name before talking to them. Some children are not completely blind but they do have difficulty seeing. To help them: Sit the child at the front and make special worksheet in large letters. Write in large letters on the board and check frequently that the child has understood. Tell the other students what they can do to help the child and read aloud as you write on the board.

When adapting the materials the teacher could allow the learner to undertake the task at later date, use study guides, graphic organizers and guided writing. Demonstrating, modelling, and prompting the expected response are also helpful. When reading, texts that have illustrations are easier to reinforce a concept. The teacher should also use a variety of tasks and texts that link, expand concepts, and use supplementary materials. In the classroom, the atmosphere should make the learners feel that their backgrounds and cultures are valued and recognized. Materials could be read orally and essentials in a listening or speaking text highlighted considering the format in which the task is presented, for example the complexity of graphs, diagrams, tables, illustrations, cartoons, etc. A range of strategies can be followed to make these accessible to learners who experience barriers to learning of whatever nature, for instance, the picture or diagram could be simplified or shown differently without compromising complexity of question, or replaced by written description and supplemented by written explanation. Pictures or diagrams could be replaced with real items or models and could be removed to reduce the amount of information. Measurements may be altered and inherently visual material replaced with equivalent non-visual material (Republic of South Africa, 2005). Special education is important for human capital development as it prepares those who would otherwise be dependants to be self-reliant. (MOEST 2005).Visually impaired student teachers would thus be prepared to become professional teachers and enable them fend

for themselves. Teacher education, as confirmed by UNESCO (2002), should be transformed in order to support inclusion.

**2.6.2 Integration of Adaptive Technology in Instruction of visually impaired student teachers**

Integration of adaptive technology is about the use of adaptive technology devices alongside other learning materials in the classroom. The adaptive device that increases participation, achievement or independence for a student with a disability is an adaptive technology. Adaptive technology helps students who are visually impaired increase their access to the general curriculum and improve their academic performance. Adaptive devices should them with the independence to compete effectively with peers.

The type of aid selected will depend on the user's preference and the task for which the device is to be used. The adaptive technology devices are used in order to help the visually impaired access the curriculum. (Purcell & Grant, 2002). According to Berdine and Blackhurst (1985:258),

> *"The media through which the visually impaired students receive information is tactile, visual, auditory, and thus total approach should be employed. The teacher should be able to modify instructional. Programming to improve exceptional children's integration into the Regular class".*

When selected and handled skilfully by the teacher, learning materials can facilitate learning. This is why it is vital for a teacher to be familiar with the wide range of resources for use (Agumba et al, 2009) According to (Jenson, Taylor, & Fisher, 2010), in classrooms that consist of students with various exceptionalities, technology can maximize educational opportunities and improve outcomes. The importance of using adaptive technology cannot be underscored. A number of scholars who emphasized this;

1) Adaptive technology devices modify or adapt the classroom for special learning needs.

2) Tactile diagrams, maps &pictures (graphics), greatly enhance the acquisition of the overall picture by the VI students, as well as their experiences.

3) Adaptive technology devices reinforce two-dimensional representations so that it is more accessible to VI students and motivate visually impaired students to learn.

4) Adaptive technologies vary communication options with touch, speech and residual vision.

5) Adapted computer technology gives a way through the lack of sight and facilitates independence by enabling the visually impaired learners to take control over their learning

(Purcell & Grant, 2002; Songe, 2004 and Agbenyega 2006).The tutor plays an important role in adapting technology. What is eventually adopted depends on the teacher's choice, the instructional objectives, learner characteristics, availability of the materials, cost and time available at the teachers disposal (Agumba et al 2009).

Willings (2015) asserts that blind students or visually impaired will need consideration to ensure they can participate fully in the classroom instruction. During demonstration lessons, the student should handle the materials before, during and after the demonstration. The student should be positioned near the front of the class. Allowing a student to move throughout the room will typically be necessary. The teacher should encourage student to use prescribed a monocular, binocular, or electronic magnification device to view information. Since taking notes can be difficult for students who are blind or visually impaired, the teacher should provide notes prior to instruction. The teacher should describe what is written on the board while writing it to allow the student to be aware of all that is presented. Tactual is the information received by touch and including

sensitivity to light touch, pressure, pain, and temperature. Activities that involve a firm, sustained touch tend to help smooth and calm students while activities involving light touching of body parts are more alerting. Teachers should encourage gradual exposure to a variety of textures and messy experiences with the goal of lengthening the experience and range of textures the student will touch and explore. Some students may appear lethargic or desire to touch everything.

At the primary teacher training colleges (TTC) in Kenya, visually impaired (VI) student teachers have been admitted in the same classes with the sighted student teachers. During instruction tutors are supposed to integrate adaptive technology for the VI student teachers. The teacher will adapt that which is available, and be competent in using it. This is a new idea for the tutors, thus an innovation. The tutors play an important role as implementers of institutional technology innovation. (Judson 2006).By using adaptive technology for VI student teachers, tutors enhance VI student teachers' engagement in meaningful learning for the attainment of the curriculum objectives. Visually impaired student teachers should therefore be integrated in various learning activities. According to Collier, Rivera and Weinburgh (2004), when integrated with emerging models of teaching and learning, technology can transform education. This justifies the need for this study to assess integration of adaptive technology for VI student teachers in primary TTCs in Kenya.

**2.6.3 Adaptive Technology Devices for Visually Impaired Student Teachers**

Both total blindness and low vision may have implications that limit learning. It is important that adaptations be made with regard to teaching and learning materials. Adapted books, specialized equipment, and other technologies provide students with sensory impairments equal access to the core and specialized curricula (Sapp & Hatlen, 2010). Some of the adaptive technology devices used by low vision VI student teachers include; highlighters, which make the print more visible, stand-alone and hand held magnifiers and reading stands. They also require spectacles mounted on magnifiers, telescopes and screen readers. Exercise books should be boldly ruled and textbooks should have large prints. Berdine and Blackhurst, (1985) assert that conditions like proper lighting, reduction of glare, print size, spacing and the use of low vision aids must be considered to ensure that the learner is reading as effectively as possible. The most effective print size will vary with learners. VI student teachers who have low vision rely on large print materials, specialized magnification lenses, or electronic enlargement for assistance they need. According to Willings (2015), there are a variety of low-tech and mid-tech non-optical devices will help persons with low vision to access print and complete activities visually. Non-optical devices range from low tech to high tech. Acetate or color filters placed over the printed page will darken the print as well as heighten the contrast of the print with the background paper.

Bold line paper provides darker lines, which allows a student to write script on the line or to construct a graph with increased contrast. Bold line paper comes in various formats, such as writing paper and graph paper. Bookstands enlarge print through automatic magnification provided when a student is close to the material being viewed. Models help reduce postural fatigue by bringing the work closer to the reader's eyes. Reading stands enable the student to bring reading materials closer to himself/herself. These stands help eliminate back and neck strain for students who need to move close to materials in order

to read it. Students should use felt-tip pens (black or color) or 20/20 pens if the student needs a darker line and increased contrast. The use of different-colored markers help a student emphasize sections of his or her notes when scanning would otherwise be difficult. A highlighting pen can be used to draw student's attention to certain words and improve contrast between the print and the page.

Low vision watches are good for students with visual impairments who are learning time management skills. Reading guides with highlighters help visually impaired students track print through a tinted window helping with both tracking needs and contrast needs. Reading guide strips are available in various colors including pink, yellow, blue, red and green. Although yellow is typically best, it is important to try the different colors with the student to determine which color is most beneficial. Adequate lighting is equally as important as contrast, distance and size for a person to see well. Providing light directed on the print will increase the clarity and assist the visually impaired student in seeing particularly when lights are dimmed during Active Board presentations. Daylight type lights can be helpful since they provide comfortable glare-free full-spectrum light. More conventional reading lamps, on the other hand, are less helpful as they must be positioned from behind, over the shoulder, and onto the task. There are many options for task lighting on the market. Typoscopes are helpful to students who find it difficult to focus on a word or track a line of print. It blocks out the surrounding text allowing the student to focus on the important information. Typoscopes are matt black cards with a small reading window that allows just a few lines of text to be seen at a time. They are helpful to users who have a reduced visual field or cataracts or corneal opacities.

Magnifiers for near viewing increase the size of the image reaching the eye and improve the visual functioning of students with eye disorders. They allow access to regular print materials both in and outside of the classroom, such as books, magazines, labels, price

tags, game boards, timetables, and menus. This prepares the student for adult life when environmental, educational, and leisure-reading materials will be available only in regular print.

Hand held magnifiers are portable and can be carried in pockets, purses, and backpacks. They are inexpensive and come in a range of powers. Some magnifiers provide illumination by directing light directly on the source. Some hand-held magnifiers double as stand magnifiers while others require the student to hold them and maintain the correct focal distance. Magnifiers may be used for such tasks as reading, writing, and artwork. They are socially acceptable since they are familiar to most people. However, they are less effective when high power is needed and when both hands are needed for a task.

Stand mounted and dome magnifiers provide a fixed distance between the lens and the object being viewed. They are helpful with students who have difficulty holding a handheld magnifier at the needed distance. Illuminated magnifiers are beneficial for visually impaired students who require high-powered devices and need supplementary lighting, or those who want to avoid reflections from ceiling lights. The magnifier puts the focus of the light on the paper creating more light and creating higher contrast. Illuminated magnifiers are available in handheld or stand magnifiers.

 Some of the computer applications that would be useful to low vision students include; Closed-Circuit Television Magnification (CCTV) and Computer Screen Magnification. These applications enlarge materials to enable students read them. Closed-Circuit Television Magnification (CCTV) enlarges any type of text or graphic material by using a small vertically mounted video camera with a zoom lens directly connected to a monitor for displaying the image. The text or graphic material is placed under the camera lens on a sliding reading stand and the image is projected on the attached video monitor.

The amount of magnification is controlled depending on the needs of the user, contrast and brightness of the image is controllable.

 CCTV can offer student teachers access to photographs, maps and colour coded charts. Computer Screen Magnification allow for the magnification of the screen with special software. The user can select and enlarge a portion up to 16 times the original size. This technology makes it possible for student teachers with visual impairments to use computers in accessing required information on maps and diagrams.

According to Willings (2015), Globe, dome, and bar magnifiers are portable and are placed directly on a page to view print. They are half-spherical magnifiers that gather light. They are not typically available in high powers of magnification so they are not suitable for everyone. Bar magnifiers are semi-cylindrical lenses that lie on top of a page and magnify one line of print at a time. They only come in magnification up to 1.5x so they are only helpful to users with minimal vision loss. Low vision devices for distance viewing will allow students with low vision to access information in the distance. This can be helpful in the classroom as well as in the community. Portable distance devices will allow students to view street signs, building signs, fast food signs, and score boards just to name a few.

Visually impaired Students can be taught to use their prescribed distance optical devices to complete short-term distance tasks such as viewing directories in office buildings, information presented on the class board, information on smart boards, and classroom charts. A low vision specialist will prescribe these to students who can benefit from their use and take into account the student's unique visual needs.

A small telescope that is great for spotting information at a distance is known as a monocular. It provides power up to 14x. They are small and can fit into a pocket or purse. They are helpful in spotting information such as information on the board, demonstrations, bus numbers, street signs, fast food restaurant menus, and scoreboards but they do restrict the visual field and limit the student to just one free hand. When a student is using a telescope to read the chalkboard, they will need to sit at a specific distance based on the power and quality of the device. This distance along with the specifications of the use of the device, would be included in the report from the Low Vision Specialist. It is difficult to copy work from the board, as the student would need to continuously shift their gaze and scan to locate information.

Screen magnifiers can be fitted on the monitor. They can magnify up to 1.5X the original source. Low visioned students who only need minimal screen enlargement use this. For students who need more magnification, screen enlargement software can be used. Screen enlargement software allow for the magnification of the computer screen so the screen can be easily read and allow the visually impaired student to see whatever is on the monitor. Talking software is available that can read the text on the page. Students who will use screen readers need to be instructed in how to: load software; turn voice on/off; make adjustments (speed, pitch, volume); navigate within a document; read (by characters, words, lines, sentences and paragraphs); and access the help file/manual to troubleshoot.

The very blind student teachers obtain information through tactile and auditory media. They require Braille machines, slate and stylus, which are used when the Braille machine is not available, brailed textbooks, tactile maps and diagrams. There are many materials for creating tactile graphics. The tools and materials will depend on the visually impaired

student and the purpose of the tactile graphic. There are Low Tech Tactile Graphics materials like Braille labels and sheets, and textured paper. They can be used to insert tactile lines on graphs, mark hand positions on embossed clock faces, illustrate geometric figures in math, create diagrams and show features on a map. Medium Tech Tactile Graphic Materials like the Swail Dot Inverter allows the user to construct simple diagrams, graphs, maps, etc. by embossing a series of single dots. The intact Eraser is a battery-operated eraser specifically designed for tactile drawing. It allows the user to erase mistakes and can be used to create dashed lines. The eraser works like a miniature iron, heating the flat tip to approximately 180 degrees. It flattens tactile drawings quickly and erases them tactually.

The Tactile Graphics Starter Kit is ideal if you only need a limited number of graphics. It can be used to create maps, graphs, illustrations, and more. The kit includes three bottles of craft ink to draw raised lines, tactually discriminable fabrics and patterns, paper point symbols that may be glued to a graphic, alphabetical index of braille signs for reference, slate and stylus, and a print manual with rules for making tactile graphics. It allows teachers to create custom tactile graphics. Raised-line masters on heavy -gauge aluminum are created that can be reproduced using a vacuum-form machine. It includes a braille slate and stylus, braille eraser, rubber embossing pad, ruler, and foil sheets.

High Tech Tactile Graphics Materials include; The Swell-Form Graphics Machine, Picture in a Flash, and Thermoform Machine. The Swell-Form Graphics Machine is a simple, fast method of creating tactile maps and graphics where the machine creates a tactile image. The Picture in a Flash (PIAF) is a simple and fast way to prepare tactile graphics. It makes raised line drawings on special paper, called capsule or swell paper.

Users can draw, print or photocopy pictures onto the swell paper and pass it through the PIAF where the heat causes the lines to swell as it reacts to the carbon in the ink, and then the drawing can be read with the fingers. A Thermoform Machine is the most accurate way to reproduce braille text and tactile graphics. It produces a tactual graphic of the master copy. A slate and stylus is a portable way to produce braille. It can be easily carried in a pocket or on a clipboard. The slate is a metal or plastic frame with openings through which braille dots are embossed with the aid of a pointed stylus. The Cranmer Abacus is adapted for individuals who are totally blind to complete math operations.

The primary tactile medium used by the visually impaired is the Braille code developed by Louis Braille in 1829, (Berdine and Blackhurst, 1985). In 1951, the Perkins Braille was invented, which was the first fast method for writing Braille. In Braille code, many words are represented by abbreviations, shortened forms of words and non-alphabetic symbols. Berdine and Blackhurst, (1985) point out that the changes in the Braille code designed to same space have created problems in sequencing of words. With the slate and stylus, they consist of a metal or plastic frame, which is sometimes mounted on a board. A pointed steel stylus is used hard punch Braille dots. Each slate has two parts connected by a hinge on the left side. The bottom side has several rows of Braille cells indented on its top. The top part has holes that correspond to the indentations. The paper is placed between the top part and the stylus is used to punch in the dots from the top. This may be tiring for the visually impaired student teachers.

The thermoforming machine acts as a photocopier for brailed work and tactile diagrams and maps. Tape-recorded text, talking tablets models, and real objects are used (Rukwaro and Kimani, (2007). Auditory devices are means for a student who is visually impaired to access print information. Auditory skills should be used in conjunction with print or braille instruction since listening is not a form of literacy Willings (2015). A recording

device allows a student to record an instructional lesson for studying, write assignments and for notetaking purposes. They may be tape recorders, CD players, MP3 players, iPads and iPhones.

A student who cannot access a print dictionary may use an electronic dictionary with speech. The dictionary is hand-held and battery operated, it uses a standard (QWERTY) keyboard on which the words are entered. Information is produced in both a spoken and large print format.

This informed the study on the adaptive technology devices for VI student teachers to be observed. Optical character recognition systems scan printed material and "speak" the text while Braille embossers create hard-copy Braille from text files. By the 1970s, adaptive technology for teaching the visually impaired had become more available. For example, the Kurzweil Reading Machine, a text-to-speech optical scanning machine, it converted printed words into synthetic speech. This provided access to print material, which was initially unavailable for the visually impaired (Berdine and Blackhurst, 1985) .It, was the forerunner for the current portable devices, including lightweight and portable scanners. Electronic and computerized braillers are also available that are more portable and light.

According to Willings (2015), High tech braille devices are available for students who are visually impaired to access and produce braille. A braille display device operates by lowering and raising different combinations of pins electronically to produce in braille what appears on a portion of the computer screen. A braille display device connects to a standard computer with a special cable. It takes information appearing on the computer screen, translates it and displays it in braille, a line at a time. Refreshable braille display

provides direct access to information, giving the student the ability to check format, spacing and spelling and is quiet in comparison to a braillewriter or embosser.

The braille embosser is a printer attached to a computer, which produces a braille copy of text. It may also be attached to braille note taking devices for the same purpose. With the use of a braille embosser, a student is able to print a braille copy of personal notes and written work. A braille translation program translates a computer file into a braille document. While a braille translation, software converts printed text into braille. Translated text may then be printed for the student using a braille embosser (braille printer).

Either a visually impaired student can take notes in class using a Braille or standard (QWERTY) keyboard, which uses electronic braille note taking devices. Script Letter Board provides a way for students to explore upper and lower case cursive letters while a full-page writing guide helps visually impaired students to stay within the writing space.

These notes may be transferred to a computer for storage, or printed in either braille or print formats. The note taking devices are often the size of a book and can easily be carried and used by the visually impaired student. A computer can be defined as an electronic machine that stores data or information and uses programs to help one find, organize or change the information. The equipment is known as hardware while the programmes are referred to as software applications. According to Dell et al. (2012), computers are also delivered with various adaptive technology devices to support students with special needs. These functions support students with visual

impairments, for instance screen magnification, increasing the size of the mouse pointer, and the ability to convert text to speech.

A computer's role in instructional process cannot be undermined since learners are actively involved in benefiting from the information in superhighway. This could be in words, games, graphics, numbers, ideas, records or messages. As a resource, a computer can store, retrieve, manipulate, transmit, and receive information electronically in a digital form. The teacher plans, executes and evaluates the instructional process. According to Agumba et al (2009:269), computers can be used for instruction in three ways;

a) Drill and practice activities-where the learner is presented with a task to which his or her response is needed. The task could be in form of questions, maps etc. to which a response is sought.

b) Tutorials where learners through well-designed programmes are exposed to specific concepts and skills in a subject. The information is given through small amounts and tests learners' mastery of the content. As soon as the learner shows a clear understanding, they move to the next exercise.

c) Simulations where learners are allowed to take roles in situations where several options are provided. They can experience the results of the options. The situations are often those that would be difficult or impossible to duplicate in a classroom setting. Simulations are effective in illustration of skills, ideas and experiences that learners may have been earlier exposed to.

Advantages of using computers include;

a) It is a fast and cheap way of communication for example e-mail, conferencing and files transfer.

b) Encourages learners to take responsibility of their learning.

c) Motivates learners thus focusing their attention and sustains their interest to the lesson hence breaking monotony associated with routine teaching.

d) Encourages collaborative learning as learners work in groups where they interact with each other. It is also adaptable to both individual and collaborative learning.

e) Encourages use of a variety of skills e.g. observation, drawing, listening etc.

f) Creates variety in the instructional process thus keeping boredom and monotony at bay.

g) Builds a sense of inquiry in the learners and encourages them to explore and improve their thinking skills.

h) Encourages innovation and creativity.

i) Allows for the maximization of learning and creates new learning experiences and deepens relationships between learners and teachers as they communicate through electronic mails.

j) Enables learners to have freedom to access a wealth of resources at their own pace and have a meaningful exchange with the content information.

k) Enables a teacher and learners to organize their work in an orderly and systematic manner as it can write, draw, or paint any work.

Agumba et al (2009:270) further explain that computers' limitations include;

a) Information or content may be destroyed by viruses

b) Requires technical expertise and considerable support to operate

c) It is expensive to purchase and maintain

d) It may expose the learners to wrong and immoral materials  e.g. pornography

e) It may expose the learners to health risks e.g. radiation

f) It can become time consuming

g) Lacks human touch in the communication process

h) Learners may abuse it and use it as a source of entertainment especially in playing games

i) Poses health risks due to exposure to rays for a long time.

j) They fail to respond to leaner characteristics hence fail to cater for individual differences e.g. ability, needs, interests etc.

Blind student teachers can access computer devices that can help them become independent learners. They include; Descriptive Video Services (DVS), Optical Character Recognition (OCR), Braille Note takers and Screen Readers.

According to Hasselbring and Glazer (2000), Descriptive Video Services (DVS) technology inserts a narrative verbal description of visual elements—such as sets and costumes, characters' physical descriptions, and facial expressions—into pauses in a program's dialogue. Some television sets and VCRs have been designed with a "second audio program" (or SAP) switch that can be turned on so that the user can automatically hear descriptive video. DVS is available for both standard VHS and DVS formatted videotapes. DVS technologies help visually impaired student teachers by providing them with access to information, and opportunities for increased socialization and knowledge building. For instance when learning about the role-play method of teaching the sighted students can watch a recorded video lesson while the visually impaired student teachers listen to the verbal description. This may also be used during microteaching in giving feedback to the visually impaired student teachers on their performance.

Optical Character Recognition (OCR) technology enables blind student teachers to place books or other print materials on a scanner and have the text interpreted and read using synthetic or digital speech. It provides access to printed matter. The first OCR system for individuals with visual impairments was introduced in 1976, when Ray Kurzweil invented the Kurzweil Reader. There are portable stand-alone OCR devices and devices

that can attach to other computers and scanners. OCR devices can enable the visually impaired student teachers listen to literature set books. Braille note takers are small, portable devices that enable students to enter and store Braille characters in the form of words and sentences. The note takers use the same six keys found on a traditional Braillewriter used for making a paper copy of Braille. They allow users to review what they have written by listening to the text-to speech function of the device. Software translators allow the Braille to be converted into text. The stored files can then be used with a standard word processor or a screen reader. The user can connect the note taker directly to a standard printer for text output or a Braille printer for Braille output to get a hard copy of the information.

Similarly, a paperless Braille display can be attached to a computer or a personal note taker that can display up to 80 characters simultaneously. Devices such as the Braille note taker that combines Braille with computer technology have made Braille much more useful than it was in the past, Hasselbring and Glazer (2000).This computer technology enables the tutor to mark the visually impaired student teacher's assignments without knowledge on Braille. This is because the technology can convert Braille to text. The student can also listen to what he/she has written which makes learning interesting.

 Screen reader software represents what is known as a text-to speech application, which analyses letters, words, and sentences and converts them into synthetic or digital speech. Today, text-to-speech software is common in many software packages, including many word processing and educational software programs in math, reading, and spelling. With synthetic speech, the computer reads text passages, analyses the phonetic structure of words, and attempts to reconstruct the words by putting together a string of synthetic phonemes that are then "spoken" by the computer. Digital speech is composed of actual recordings of human speech.

Willings (2015) suggests Software programs designed for individuals who are blind or visually impaired;

1) CDesk is a single program with fourteen core applications, with speech recognition system that allows a totally hands free user experience.

2) JAWS is a screen reader, developed for computer users whose vision loss prevents them from seeing screen content. JAWS reads aloud what is on the PC screen and gives the user a unique set of intelligent tools for navigating and accesses Web pages and all screen content.

3) Talk button is a text-to-speech adaptive technology that allows one to read, work and create right in Word, while listening. Its unique automatic scrolling feature lets you read along easily, highlighting spoken text word-by-word, or line-by-line. It reads texts from email, web browsers and programs like Pages, Preview, pdfs and Text Edit. It is very user-friendly, fast and responsive, quickly customized with one-click changes and shortcut keys. Talk Button uses high quality voices in multiple languages.

4) Web anywhere is a web-based screen reader for the web. It requires no special software to be installed and enables people who are blind to access the web from any computer that has a sound card.

5) Word Talk is a Windows text-to-speech plugin for Microsoft Word. It will speak the text of the document and will highlight it as it goes.

The adaptive technology devices should be easily accessible to both students and tutors. Since the need for school resources is of paramount importance in modern day's educational systems as stated by Chumo (2009), adaptive technology devices should be

available and in use for integration in instruction in primary TTC thus justifying the need for this study.

Students who are visually impaired that use their tactual skills as a primary or secondary mode of learning need tactual adaptations to materials in order for them to be accessible. There are a variety of low and medium technology devices that allow persons who are visually impaired to access and produce braille, complete math activities and activities of daily living tactually. Braille compass allows a student who is visually impaired to find North, South, East and west independently.

Braille watches are important for students who are very blind when learning time management skills while Bump Dots provide easy identification of items. These Bump Dots allow a variety of uses from tactile marking of everyday items such as computer keyboards, telephone keypads, and multiple switches.

## 2.6.4 Tutor Training on Integration of Adaptive Technology for VI Student Teachers in Instruction

Teachers at all levels require effective and sufficient education to be able to adequately carry out their roles and responsibilities thus stressing their importance in education. This is acknowledged by Otiende et al (1992) who say that trained teachers are vital for quality education. A tutor is a manager organizing his students to accomplish set objectives. He is a resource person providing his students with information and guiding them to other fruitful sources. He also stimulates and arouses the interests of his students so that they soon generate their own motivation (Farrant, 2009). Bhattacharya (2002) stresses that training is a systematic tailor made programme to suit needs and develop certain attitudes, actions, skills and abilities in employees irrespective of their functional

level. Teachers who are not trained properly hinder the rate of learning for students with visual disabilities. This is because teachers of students with visual impairments are supposed to provide specialized instruction and support services for these students, and this instruction should be adequate to compensate for the student's lack of visual functioning. (Silberman, Bruce, & Nelson, 2004).

With the inclusion of visually impaired (VI) student teachers in primary teachers, training colleges (PTTC) there is need for tutors to be in-serviced. In-service training is a lifelong process in where the teacher constantly learns and adapts to the new challenges of his job. Educational authorities are recognizing the need for in-service training. It helps in improving specific teaching skills thus coming to grips with new developments such as new curricula, new methods and other innovations. It may be provided to help in preparation to teach handicapped students (Farrant, 2009). In-service updating and renewal of knowledge, skills and capabilities is now widely acknowledged as a high priority (MOE, 2009). Tutors need regular training on special education, and on how to use adaptive technology devices for VI student teachers creatively and effectively. This could be done by KICD which is charged with the responsibility of conducting in service courses and workshops for teachers involved in carrying out experiments and trials of any new syllabi and teaching materials (Agumba et al 2009).According to Farrant (2009:370),in-service maybe done through;

a) Lectures, films and conferences in which teachers discuss with experts the problems they face at work.

b) Seminars and workshops in which practical solutions to current difficulties are discussed and materials required for implementing these solutions are devised and produced.

c) Exhibitions in which teachers are introduced to new textbooks, teaching materials, equipment's etc. to help them in their work. Also exhibition of children's work in neighbourhood schools to give teachers an idea of the standards being achieved.

Once familiar with the adaptive technology devices and confident in their use, teachers are able to see its application within the curriculum (Bitter and Legacy, 2009). The special education teacher must be able to evaluate instructional materials and select the most effective ones. They must know how to use a variety of instructional materials and individual equipment (Berdine and Blackhurst, 1985). Teachers should also be supported in developing and sustaining alternative pedagogies and teaching strategies (Dede, 1997). Effective professional development needs to provide time for training, experimentation, and follow-up support (Casey & Rakes, 2002; Levine & Donista-Schmidt, 1998). A teacher should be able to update knowledge on a regular basis to keep pace with the new trends in the profession (Agumba et al 2009:154).

According to the South Carolina Assistive technology program, the more fully integrated adaptive technology is into the materials used by a teacher, the more it helps a VI student learn and not merely perform.

Anderson, Klassen, and Georgiou (2007) and Gronseth (2011) in their studies on barriers to technology implementation pointed out that there was inadequate pre-service and in-service training for regular and special educators. They lacked the knowledge they needed to be more effective at teaching and dealing with students with special needs. Farrant (2009) asserts that more needs to be done to allow teachers to add to their training and when their work calls for it. In order to provide quality education for special needs students in the general education classroom, all of the necessary resources must be available for both the students and the teachers.

According to Koch (2017), limited training of teachers is a major barrier to learning for the disabled. The primary concerns of teachers were; lack of funding for technology acquisition, lack of time for learning about special needs, investigating assistive technology options, and the time required to actually obtaining the technology. When students are not properly trained in using a new piece of technology, especially while they are trying to learn new academic content, they are more likely to abandon that technology. If the teachers are not proficient in all of the technology options, they will be unable to train and teach the students how to use the technology, there by contributing to the abandonment of the technology. This is in line with what Bausch and Ault (2008) and Gilakjani et al. (2013) who assert, that lack of teacher training is another prime barrier to the effective use and implementation of adaptive technology in the classroom. It is the main obstacle to the use of technology by teachers following their pre-service education. In-service courses in special needs education should be mounted for all teachers already in the field. This will help minimize negative attitudes and create more positive perception towards children with visual impairment. As teachers become more inclusive practitioners, they are aware of providing quality 'opportunities for the participation of all learners in the class and hence in the school and community' (UNESCO, 2002).

According to Basham and Marino (2013), Computers are vital forms of adaptive technology since they offer several possibilities for writing, reading, finding information, speaking, or controlling a person's environment. Outdated computers were found to be prime barriers for instructors. Technical obstacles hindered the delivery of instruction and the natural flow of class activity, and these sequentially discouraged instructors from incorporating technology into their learning activities (Scheeler et al., 2010). The primary TTC adapted syllabus for visually impaired students asserts that tutors who teach visually

impaired students should be proficient in English Braille and be competent in the development and production of quality tactile diagrams and maps. (KIE, 2005).Thus the study sought to establish tutor training on integration of adaptive technology. According to Dakwa (2011), more brailled books should he made available to visually impaired students. There is need to adapt the school environment to accommodate participation of the children with visual impairment in sport. Teachers need to be in-serviced so that they can be equipped with skills to effectively include children with visual impairment.

The tutor should also be able to select and operate adaptive technology equipment and software as well and use it in in-service and pre-service instruction. Songe (2004) in his study on curriculum barriers to successful inclusive education found out that there was lack of trained personnel among others. His study was carried out at the Kenya polytechnic, how was the situation at the Primary TTCs in Kenya? This study sought to answer this by examining the training of tutors on integration of adaptive technology in primary TTCs in Kenya.

**2.6.5 Tutors' Attitude towards Integration of Adaptive Technology in instruction of Visually Impaired Student Teachers.**

According to the adapted syllabus for the VI student teachers, tutors are expected to have positive attitudes to student teachers who are visually impaired (KIE, 2005).This has also been stated by other researchers. Attitudes formation is influenced by perception with regard to a particular object or action (Serem, 2008). Cope and Ward (2002) in a research on teacher perceptions on the integration of learning technology in the classroom concluded that teacher perceptions of learning technologies are likely to be key factors in the successful integration of learning technologies. Attitude refers to 'a psychological tendency that is expressed by evaluating a particular entity with some favour or

disfavors'. There is a link between attitude and one's evaluation of a given object or state of being. Visually impaired students have the internal self-construct, which makes them have a certain psychological tendency of what other peoples' attitude is towards their state of being visually impaired. (Eagly and Chaiken, 1993). Teachers' attitudes toward inclusion is critical in implementing the goal of inclusive schools and availability of support and perceived competence are important factors. Without the correct attitudes in the regular classrooms, inclusion of pupils in regular classroom becomes impossible (Zindi, 2004).

According to Chireshe (2011), long-serving teachers in programmes related to counselling sometimes suffered from burnout and had more negative attitudes towards those programmes than new teachers. Similarly, familiarity with blind students may not necessarily produce positive attitudes towards them in inclusive schools. The most important way of translating of policies into practice always was to reallocate resources for staff training and mass procurement of material resources. It was also necessary to move on to the identification of learners who could be serviced from their least restrictive environments.

Teacher education is pivotal in developing the affirmative attitudes and skills required for successful inclusion. Bortoli (2011) asserts that the high level of education and training in special education resulted in a more positive attitude in teachers toward inclusion. Positive attitude towards inclusion of disabled students is one of the requirements of the success of Inclusive Education. Not only is the positive attitude of the teacher important, but the positive trend of the society towards inclusion of disabled people is necessary to achieve the desired success and the aim of Inclusive Education. The teacher is the most influential person in the process of education therefore when the attitudes and perceptions

of the teacher need changing, the process needs to begin early in the process at the foundation of skill development.  Formal educational training and inclusion of a compulsory module on diversity in a post-graduate degree have been identified as factors that promote an inclusive attitude. However, some authors argue that improving knowledge of and confidence in inclusive education alone is insufficient in improving a positive attitude towards inclusion and reducing related anxiety. This is because there is a gradual decline of positive attitudes towards inclusion in trainee teachers as they advance in their training years due to increased awareness of the challenges one is likely to face by including all students with disabilities (Sharmila et al. 2015; and Salem, 2013). According to Mataruse (2002), the teacher's type of training influences his/her attitude towards children with disabilities. The attitude of specially trained teachers is more positive to special class /unit placement than that of teachers without specialist training. The success of inclusive education depends on teachers' attitudes. This implies that for inclusion to be successful then teachers need to be trained on integration of adaptive technology.

 According to Gary (1997), Agbenyega (2006), Haralambos and Holborn, (2008) and Yara, (2009), teachers who feel unprepared and fearful to work with learners with disabilities in regular classes, display; frustration, anger and negative attitude towards inclusive education due to the belief that it could lead to lower academic standards. Access to resources and specialist support affects teacher confidence and attitudes toward inclusive education for students with disabilities. Teachers develop and establish various attitudes towards their students, which have a significant effect on their educational attainment. Students' academic performance was negatively affected by the teachers' attitudes during learning processes. Teachers' lack of confidence due to poor conceptual and phenomenological subject foundations may negatively influence academic

performance (Barros and Ellia, 2000). The willingness of teachers is also a prerequisite for successful implementation (Pijl & Van Den Bos 2001, p. 113).

Therefore, teachers need the self-confidence to carry out their duties in demanding unique situations. Peoples attitude tend to evolve as they become more familiar with change. Studies by researchers (Floyd, Smith, Canter, Jeffs & Judge, 2008) indicate that in order for teachers to use adaptive technology in a manner that brings forth a strong, positive impact, they must be confident and well- trained to do so. According to (Sharmila et al. 2015), attitudes are conceptualized as constructs comprising cognitive, affective and behavioral components. Teachers' attitudes towards inclusion are often based on practical concerns about how inclusive education can be implemented, rather than be grounded in any particular ideology. Common practical concerns raised by teachers include;

1) Accommodating the individualized time demands of students with disability without disadvantaging other students in the classroom.
2) Being apprehensive of the quality and quantity of work output of children with disabilities.
3) Lacking adequate support services.
4) Limited training and competence in supporting inclusive educational practice.

Effective change management programs are frequently sequential with early measures directed at overcoming the initial apprehension, denial, anger and resentment but gradually evolve into a program that supports compliance, acceptance and internalization (Agumba et al, 2009). Scardamalia and Bereiter, (2003) assert that teacher attitudes and beliefs are powerful forces which significantly influence actions in the classroom. Teachers tend to develop positive attitude towards students who have neat and clean

appearance, those who are known to come from educated families and those who are able to conform to the teacher's own standards Miller (2001). According to (Haralambos & Holborn, 2008), labeling of pupils by teachers can have important effects on their academic progress. Teachers can label students basing on their disabilities. Students who teachers label as gifted in class make the greatest progress, primarily because of differential treatment by teacher while those labeled as less intelligent will lack motivation and fail to recognize the importance of their subjects thereby affecting their academic performance (Mwamwenda, 2004; Hayes, 2010; and Demanet & Van Houtte, 2012). The Kenya Integrated Education Program has picked up from the Salamanca declaration, and shifted to viewing the disabled as people who are incapacitated to seeing them as potential as their sighted counterparts. With the recognition of the potential and capabilities of handicapped children, what is needed is to change the existing attitude or the formation of new attitudes (Zimbardo, et al., 1977) which is important because attitude has been one of the greatest impediments towards the integration program. Visually impaired students feel shunned by the sighted students because of the latter's attitudes. Attitude change towards the visually impaired students should be holistic beginning from sighted students to teachers, parents and the society. According to Maguvhe (2014), Students envisaged that challenges would be found around the supply of necessary resources for the education of blind students, negative attitudes among some teachers and students and possible lack of requisite support. This implies that lack of the necessary equipment and software, adequately trained educators, an adapted physical learning environment and social set-up, could be a challenge for a learner. Teachers agreed that there were few specialist teachers for students with disabilities that it would take some years before children in full-service schools could get adequate support from trained personnel.

They also influence professional practice, and thus are crucial factors in the implementation of new technologies (Haney & Lumpe, 1995). Further, teachers' attitudes towards a certain strategy affects their efficiency in teaching (wanjala, 2005). Kennedy and Deshler (2010) opine that many teachers often reject new tools that may not easily fit within their current approaches to teaching and learning while technology is rapidly changing and evolving.  If technology in inclusive classrooms is to be optimized, Teachers should be informed of technological advances for instruction. Teacher training fosters positive attitudes toward Inclusive Education practices. Many teachers are willing to receive training to improve their knowledge and skills, in order to help children with special needs (Rakap & Kaczmarek, 2010). With regard to the perception of teachers, Korir (2015) in a focused group discussion found out that, the teachers' initial perception about students with visual impairment and the program was negative and full of prejudices. After interacting with the visually impaired students, most of the sighted students and their teachers found them to be like any other students. They were as brilliant as the sighted students were. Because of this mixing the visually impaired students with the sighted ones has improved the public image about visually impaired children in the society.

Tutors in primary TTCs need to have positive attitudes towards the teaching of VI student teachers, which was the focus for this study. To implement technology successfully in their classroom, teachers must develop positive attitudes and feel comfortable using them as instructional tools (Rakes & Casey, 2002). Kabue (1984) in his study on the integration of handicapped students in primary schools noted that attitudes of teachers towards integration were favourable but should also be reinforced through special training, in-service courses and provision of support materials. Teachers consider that

educational technologies can enhance the learning experience of students in the special education classroom. Teacher training session can modestly improve regular and special education teachers and administrators' knowledge on special education (Woodbury, 2015; Maida, 2015).

Inadequate training is the main barrier to the teachers' use of technology following their pre-service education as reported by Gilakjani, Leong, and Ismail (2013). Each disability creates unique challenges thus teachers must understand each student has needs and identify potential adaptive, which will work for that student. The teacher must also evaluate the effectiveness of the adaptive technology and try other devices. Teachers need to persist to find the right adaptive technology for the disabled student (Brownell & Leko, 2014). From research carried out by O'Malley, Jenkins, Wesley, Donehower, Rabuck, and Lewis (2013) on the  use of iPads to teach mathematics, the students were more engaged when using the iPad. In fact, the students were disappointed when they returned to paper and pencil. They made better progress when using the iPads than with paper and pencil. However, teaching learners who have disabilities among many without disabilities in the inclusive setting poses an instructional problem for teachers (Mugo, 2013). According to Korir (2015), the teachers' perception towards the integrated program, whether positive or negative, was of crucial concern since the teachers formed the immediate company for the students with visual impairment in a school environment. Teachers felt that the students with visual impairment had been made to suffer more by being brought in a regular program.   This was because there was little commitment from the government through the ministry of education to boost the students with visual impairment .The teachers said that there were no trained teaching staff, no special fund, teaching and learning facilities.

A lot of effort has to be put into the inclusive education process since mere familiarity with blind persons does not in itself improve attitudes. The school has to evolve through establishing and adhering to policies, which teachers, administrative staff and students have to uphold. Inclusion fosters the integration of students with disabilities into their parent societies earlier in life and ensures equal opportunities for all students to use resources available in the school and the community, if all ideal resources were put together for the benefit of all students.

Teacher training and preparation have been noted as a disadvantage of inclusion since teachers may not be adequately trained to provide necessary adaptations for students with disabilities (AFB, 2012). Teachers may not be aware of the most appropriate strategies to use to individualize instruction for students with specific needs. While legislative requirements and reported benefits are pushing more and more children with disabilities into general education settings, some researchers continue to cite apprehension to this model (AFB, 2012).

The most influential aspect of instruction of students with visual impairments is making sure these students have access to instructional materials. Students with visual impairments must master the same educational curriculum as their sighted peers, although the visual impairment imposes restrictions on their ability to access the curriculum when presented in the typical method by the classroom teacher. Students with visual impairments must also be taught the necessary skills to obtain access to information, which may be tedious. (Riley, 2000).

According to Nyoni and colleagues (2011), general education teachers should have both appropriate kills and attitudes in order to adequately and meaningfully assist students with visual impairments in general education settings. Teachers should be trained to implement various strategies to facilitate students' assimilation into the classroom, school, community and work setting. Experts contend that students with visual impairments need instruction by a teacher with expertise in the areas of visual disorders, and sufficient training in effective use of strategies.  This is because the visually impaired student not only required to master the same educational curriculum as their peers, but also the Expanded Core Curriculum (ECC) if they are to be successful (Hatlen, 2000).

Jones (2017) asserts that, lack of teacher training is a barrier for students because of inadequate skills. These teachers are not aware of how to properly accommodate and modify the assignments in classroom so that the students have access to curriculum and environment. This has an effect on how much the teacher can provide support in the classroom. The lack of support provided by teachers seemed to have a lasting effect on students.

## 2.6.6 Visually Impaired Student Teachers' Perception on Integration of Adaptive Technology in Instruction

Perception is a persistent tendency to feel and behave in a particular way towards some object or person (Mutai, 2010). Examining the perception of a target population is a widely used strategy based on the premise that perceptions matter and often influences behaviours. This approach has been used to study faculty perceptions of distance education (Belcheir & Cucek, 2002), and student perceptions of online learning (O'Malley & McCraw, 1999). Students enjoy practical work in class and use of resources

improves perceptions and interest in the subject, Koech (2012). This implies that when tutors use adaptive technology when teaching, VI student teachers are bound to have interest in what is being taught and perceive it positively. When they have negative perceptions then they may not be enthusiastic about using the adaptive technology devices. Student teachers affect the manner in which instruction is initiated, designed, and delivered and therefore VI student teachers must be comfortable with the use of adaptive technology.

According to Groff and Mouza (2008), Students need to know how to use the technologies embedded in a project in order to achieve success. If the students in a class are not proficient with the tools they will be using, appropriate training should be provided.VI student teachers should be proficient in Braille and be able to use adaptive technology devices. This way, the VI students will understand the concepts taught in different subjects. Apart from the VI students knowing how to use adaptive technology, the tutors should have a positive attitude towards integration of adaptive technology since this affect the formers' attitudes. Serem (2008) asserts that learners' attitudes can be influenced by teachers' attitudes and availability of learning facilities. Thus, the adaptive technology devices should also be available for the VI student teachers to use. According to Korir (2015), visually impaired students said that they were treated like abnormal students in the school. Their basic needs were not being addressed. Given the right learning environment, the visually impaired students would attain social and survival skills in regular school environment. This would serve as evidence that the disabled can be mainstreamed in to the society. If all the necessary measures are taken into consideration to minimize some of the challenges facing visually impaired students, then the influence of an integrated education program on performance of students with visual impairment would be positive.

Katz and Mirenda (2002), opine that increased opportunities for students with disabilities to interact with and learn from peers without disabilities has been shown to correlate with measures of self-esteem, social skills, positive emotional and behavioral outcomes. It has also influenced academic achievement for students with developmental disabilities. Schools also benefit when they have students with disabilities in general education settings, since funds allocated for special education classes can now be put elsewhere to fund inclusive schooling. When students are fully included in the general education setting, the money that was used for those segregated services may be used elsewhere.

According to Muchilwa (1998), students had positive attitudes towards the benefits of instructional materials for History and Government. This study therefore examined the student teachers' perception of integration of adaptive technology devices for VI student teachers in primary TTCs in Kenya.

**2.6.7 College Administration's support in the Integration of Adaptive Technology in Instruction.**

The college administrators are the key individuals in inclusive education and thus should have knowledge regarding adaptive technology for visually impaired VI student teachers. The entire process of introducing technology in any organization including educational institutions requires leadership (Mertz and Mertz, 2003). According to Maguvhe (2014), the translation of policies into practice always comes with the need for the reallocation of resources for staff training and mass procurement of material resources. It also comes with the identification of learners who would be serviced from their least restrictive environments. The fact that parents have a right to choose a school for their child means that those who do not trust the inclusive route will still opt for their traditional 'Schools for the Blind'. The challenges will be in the area of gathering adequate financial

resources for community sensitization, staff training, procurement of physical resources and ongoing staff development.

Ngigi (2007), who asserts that poor administrative procedures result in poor quality work for instance when school equipment's are delayed, teachers cannot teach well which leads to poor performance by the learners, stresses this. According to Eyo, Joshua and Esuong, (2010, p. 90), school principals can thwart new programmes if they have little knowledge and conviction about them. This could be the case with the inclusive education, despite much publicity since 2001, is still barely visible in many schools. Of essence in this regard is the idea that the inclusive education agenda needs the volition of school principals for it to be visible.

The administration is supposed to; Provide teaching/learning resources, supervise curriculum implementation, motivate tutors and coordinate with the ministry of education. According to Crowther, Dyson & Millward (2001), many inclusive schools do not maintain a register of students with Special Educational Needs. Such a register is important because it could reflect the range of special educational needs of all students in a particular school, and the number of students with special educational needs. Many learners with visual impairments who were in regular schools were there, more by default than by deliberate inclusion. That record therefore enables the school to plan its staffing function with the teaching load in mind. There is also a tendency for parents and teachers to regard students with low vision as fully sighted and those who are blind as totally blind without light perception (Dickerson, Smith and Moore, 1997). This leaves many students receiving education without any specific support. Inclusive education helped children by preparing them for later life in an inclusive society, the establishment of meaningful

friendships, an increase in the number and type of resources available to every student and better appreciation (and acceptance) of differences between individuals.

According to Agumba et al, (2009), the educational administration ensures that those available human and material resources are effectively used for the achievement of stipulated educational objectives.

In a learning institution education, management deals with planning organizing division of labour directing coordinating and controlling physical resources for effective delivery of educational services. In planning, the administration looks at the objectives to be achieved strategies, effort, time and resources both human material by which to accomplish the objectives and measures in place to assess the success of what was set to be achieved. There is organization in acquiring both human and material resources that are necessary to accomplish educational goals.

There should be linkages between the various administrative segments in an organization so that events are harmoniously attended to immediately. Division of labour means assigning responsibility to members of an organization depending on their skill, talent and experience. This kind of assignment enables a school to achieve its stated goals. In directing and controlling, the administration must provide clear information on what is expected at each stage, obtain feedback on performance and take the appropriate action if necessary to remedy the situation. Any tutor will acknowledge the importance of the administration. As directors, administrators influence the college structure and culture, constituting the venue for any instructional initiative. Therefore, administrative support (or lack thereof) can make or break teachers' undertakings to integrate technology into

the classroom. With minimal support, even the most talented teachers will have little success in technology integration (Becker & Ravitz, 1999; Zhao et al., 2002).

It is the responsibility of the school administration, faculty, and staff to develop their own understanding of technology and learning, and create a working environment that condones these efforts (Collier, 2001). Money can be spent on staffing to support the general education teacher as well as materials for adaptation of curriculum (McCarty, 2006).

College administrators should not only advocate the use of technology but also provide support mechanisms such as professional development, time for planning and collaboration, and necessary resources (Earle, 2002; Groves, Jarnigan, & Eller, 1998).According to Morris (2002) necessary resources for integration of technology include; adequate access to hardware and software, technical and pedagogical support, and professional development plans among others. Administrators who successfully acquire adequate access to resources have taken the first major step toward supporting technology integration, Frank (2003). Supportive leadership and administration within the school setting is an identified key factor in promoting successful training for staff and students in the use of assistive technology. (Alliance for Technology Access,2000; Overbrook School for the Blind, 2001).The resources can be purchased, borrowed, donated or made by the teacher (Agumba, 2009).With regard to this study, tutors needed to be supported by the administration through provision of adaptive technology devices for VI student teachers and frequent training on how to integrate adaptive technology for VI students. McMaster (2013) explains that successful inclusion is a culmination of the entire school embracing the inclusion model. The culture of a school, which expresses compassionate, understanding of differences in students, and perceived as a resource is important. The staff should ensure that the students' needs are identified and intervention

and support services given. According to Maguvhe (2014), societal resources should be used for the good of all students. The role of school principals in both implementation and publicity is significant.

From the report in *Technology for Learning: Students with Disabilities*; Data from the interviews demonstrated that the Principal's role in relation to both disability and technology was fundamental to the success of the learning programs. This is also supported in the *Promising Practices in Technology* report, which says that; Change depends first on leadership's vision, commitment, knowledge and resources. Administrative support is needed to shepherd and encourage teachers to develop new skills and implement new strategies related to technology. (Alliance for Technology Access, 2000).According to Guto (2010), teaching facilities, financial resources, quality of teaching and learning resources have influence on teaching. Therefore when funding incorporates technology acquisition and ongoing training for staff working with students using assistive technology, it influences assistive technology use. (Male, 2003; Alliance for Technology Access, 2000; Overbrook School for the Blind, 2001; Lazzaro, 2001; Casimir, 2001).

## 2.8 Related studies

Various studies have been carried out with regard to learning resources, training of teachers, leaner, teachers' attitudes, and administrative support in schools. Findings have shown that there is a general inadequacy of instructional resources available and used for teaching and learning in schools. Among these are Tuimur (2011) who studied the teaching of conflict and conflict resolution in Social Studies in selected primary schools in Kosirai Division, Nandi North District and Muchilwa (1998) who conducted a survey on availability and use of instructional_materials for teaching History in Secondary

Schools in Mombasa District. Koech (2011) researched on the availability and utilization of instructional resources for the teaching of science in primary schools in Kosirai Division, Nandi North District while Malakwen (2000) looked into teacher trainee's attitudes towards the implementation of Social Studies curriculum in Kenya's teacher training colleges. A study on integration of the disabled, Korir (2015) found that there was little commitment from the Kenya government through the ministry of education to support the program. The students with visual impairment lacked Braille papers and the school administration did not handle them as part of the school; instead, they relied on the Kenya Society for the Blind to coordinate the program. The administration did not have have the guidelines / policy on the implementation of the program. Few teachers had once been taken for an in-service course on special education while the rest had never been trained at all.

These studies established that teachers in primary schools lacked sufficient instructional materials for effective teaching of Social Studies and Science; teachers also did not have adequate time to prepare resource materials for the lessons. The secondary schools investigated did not have enough instructional materials for teaching history while materials used by teacher trainees during teaching practice in primary schools were inadequate and of low quality. The situation was not any better in primary TTCs where Kafu (2011:48) asserts that facilities and resources for preparing schoolteachers were pathetic. They were inadequate, obsolete, dilapidated and unsuitable for producing competent teacher who can operate in this century. The results have been the same with the disabled, for instance Kiaritha (2011) in her study of implementation of persons with disabilities act (2003) in public universities in Kenya wrote that a major challenge is lack of assistive devices for students with disabilities such as Braille machines for the blind. There was poor provision of special facilities and services.

On the contrary, Ndungu (2013) in her study on pedagogical strategies for English language literacy in deaf schools established that teaching and learning resources in standard four classroom for hearing impaired learners were adequate but were traditional and had not been used over time. Available resources were hardly utilized and teachers found them to be cumbersome or inappropriate for their learners. Learners were unaware of the materials at their disposal .Improvisation of teaching and learning resources was not done. Douglas and McLinden (2005) reviewed pedagogy and visual impairment education and argued that the research of the past has emphasized the concept of gaining access. The rationale for this appears to be a view that the impending barrier that individuals with visual impairments are faced with is the lack of access to visual information (Cavanaugh, 2002).

This study therefore sought to find out whether the same conditions prevailed in the Primary TTCs that had admitted visually impaired student teachers. According to Korir (2015), mixing the students with the visually impaired, had generally improved the public opinion about the handicapped in the society. Students with visual impairment lacked storybooks, poetry books and therefore could never be at par with their peers in terms of reading and learning. The teachers gave an example of a student who due to sickness was given drugs that rendered her loss of sight. This particular student came back to school but she was in denial of her state. She took time to accept her status of being blind due to this attitude became slow in learning to use Braille machine, she developed hatred towards the others who were active in participation in class while answering question something she could do. The student could not see any illustrations on the black board and could not even see the charts being used to teach the other students. Visually impaired students ventured on their own since most of the teachers did not have any

experience in handling the visually impaired. These conditions have made teachers feel it is unfair to mix the sighted students with the visually impaired.

With regard to training of teachers; Too (1996) in his study on  the availability and use of media resources in Mathematics instruction, in secondary schools in Nandi District, Kenya established that trained teachers are more inclined to use media than untrained ones. He further asserts that training provides a teacher with the skills and knowledge on how to handle a learner. Kimani (2011) in his study on assessment of mathematics teachers' in-service training needs revealed that teachers needed to be motivated by taking part in in-service programs. In service programs, improve teachers' level of innovation and creativity and therefore benefiting learners a lot. In addition (1996), also established that training gives a teacher confidence to not only plan and organize the learning environment so that it is conducive to the learner but also gives the teacher an insight in the use and production of instructional materials. Koech (2011) recommends that in service courses should be developed and mounted for teachers for purposes of upgrading the teachers professionally. From these studies, importance of training of teachers cannot be underscored. There was need to establish the training of teachers on integration of adaptive technology during instruction so as to ascertain the state of affairs in primary TTCs who admitted VI student teachers.

Teachers have been found to have a positive attitude towards the use of instructional materials. Muchilwa (1998) established that trained and untrained teachers liked using instructional materials for history and government. On the contrary, Ogoma (1987) in a survey on resources for teaching in Nairobi schools found that the teachers were not eager to use the available instructional materials or even produce them. Koech (2011) adds that teachers' experience has a strong relationship with attitude towards use of instructional resources i.e. teachers experience determines the attitude of the teachers

towards the use of the instructional resources in the teaching of science. Chemwei (2013) carried out a study on factors influencing teacher educator's level of information communication technology integration in teaching in primary teacher training colleges in Kenya. He established that teacher educators have a positive attitude regarding ICT integration to instruction and that teacher motivator's influence ICT integration into teaching.

 According to Muchilwa (1998), students had positive attitudes towards the benefits of instructional materials for History and Government.  Menjo (2012) evaluated the effectiveness of implementation of information communications technology (ICT) in primary teacher training colleges in Kenya and found out that students had a positive attitude towards ICT implementation. Chemwei (2013) concurs with this.

Koech (2011) established that lack of finance was a factor that contributed to lack of necessary materials in secondary schools. Chemwei (2013), Tuimur (2011) and Muchilwa (1998) recommended that financial and administrative support should be provided for acquisition and use of instructional materials. Teacher training colleges should provide support to the teacher educators for them to integrate ICT in their instruction and instructional materials should be made available to teachers. Menjo (2012) the lecturers held the view that the management of institutions was not receptive to new ideas. Although in each college the support of the principal tends to supersede that of the computer experts, the two have not supported ICT implementation programmes adequately in the teacher training institutions.

Chemwei (2013) concluded that there was little integration of ICT by teacher educators in primary teachers training colleges and Menjo (2012) adds that ICT implementation

effectiveness was still very low. This guided the study with regard to integration of adaptive technology devices in primary TTCs in Kenya.

According to (Mugo, 2013), in Kenya, students with visual impairments largely used analogy kind of technology in their daily educational activities which comprise of Braille, slate and stylus accompanied with Braille papers. Majority are not exposed to modern technology their learning is majorly at the mercy of the sighted guide. Students with visual impairments used braille and interacted sparingly with JAWs, NVDA, Dolphin pen and other forms of adaptive technology during computer lessons. The amount of time allocated could not allow students to independently study and achieve education as per individual's ability.

The school administrators said that the purchasing of teaching and learning materials was expensive and the government did not assist financially. This made the visually impaired students miss relevant lessons as they waited for the materials to be bought and sometimes it took more than a month before it was received. Teachers were not inducted on their entry to school and noted that much of the visually impaired students' time was wasted since the teachers were not available for them during the time for extra coaching. Because of this, most of the visually impaired students had reservations amongst themselves (Korir 2015).

Mugo (2013) further says that students and teachers feared technology due to lack of exposure and skill, but with interaction and gaining of skill, adaptive technology became a necessity for accessing knowledge and information conveniently. The above studies have portrayed the use of adaptive technology in improving educational achievement of students with disability but none of it has given a conclusive report on the use of adaptive technology in Primary Teacher Training Colleges. Therefore, this study was keen in

giving a conclusive report on integration of adaptive technology for visually impaired student teachers in Primary TTCs.

**2.9 Chapter Summary**

Chapter two undertook a review of literature concerning the integration of adaptive technology in instruction. From the reviewed literature, the following is highlighted;

a)    Adaptive technology devices used for teaching VI student teachers during instruction are   varied and should be provided for use during instruction.

b)    Integration of Adaptive technology devices in instruction is essential for the student teachers to access the Primary Teacher Education Curriculum.

c)    Training of tutors in the preparation and use of adaptive technology is mandatory. The tutors should be able to read Braille in English, prepare tactile maps and diagrams and use them appropriately during the lesson.

d)    Tutors attitudes and learners perception of integration of adaptive technology devices for visually impaired student teachers are largely affected by availability of adaptive technology devices, and training of tutors on integration of adaptive technology. This is because when tutors are trained, they become confident and thus integrate adaptive technology while teaching. The learners on the other hand enjoy the lesson and understand what is being taught.

e)    The role of the college administration in the integration of adaptive technology devices in instruction is very crucial. This is because the administration is supposed to provide the adaptive technology devices, facilitate the training of tutors on integration of technology and ensure that the VI student teachers learn in a conducive environment.

f) Researches done on the integration of adaptive technology in instruction have shown that many teachers are not prepared on integration of adaptive technology; adaptive technology devices are expensive and thus have not been purchased by institutions. Teachers have been found not to be confident when teaching visually impaired students. The reviewed literature has informed the study on the features to be included in the research instruments. Many of these studies have been carried out at primary and secondary levels. Therefore, there was need for a study to be carried out on the integration of adaptive technology for VI students in instruction in primary TTC. The next chapter explains how the researcher obtained and analysed data for the study.

## CHAPTER THREE

## RESEARCH DESIGN AND METHODOLOGY

### 3.1 Introduction

This chapter discusses how the researcher obtained data for the study and how this data was analysed. It consists of the research design, research methodology, and area of study, target population, sample size and sampling procedure. Data collection instruments, validity and reliability of the research instruments, ethical considerations, data collection and analysis procedures.

### 3.2 Philosophical Underpinnings of the Research

According to Mingers, (2001) methodology describes the overall approach to research design while Cresswell (2003) sees methodology as the strategy or a plan of action that

links methods to outcomes and governs the choice and use of methods. A research methodology therefore, forms an overall paradigm/approach that shapes research approach. Mertens (2008) further explains that research paradigms are rooted in philosophical paradigm, which aims to determine the direction of research, how the research reaches its reality and how they answer the questions of the seeking mind. They also helping the researcher to use appropriate methodology and apply the research findings.

This study adopted a mixed method strategy where both quantitative and qualitative approaches are used to test different methods of inquiry for their effectiveness in achieving the intended goal. This eclectic worldview stance was derived from the work of Pierce, et, al., (Cherryholmes, 1992). The philosophical assumption adopted was positivist of a fixed, measurable reality external to people 'out there' in the world that needs discovering using conventional scientific methodologies (Bassey, 1995).Positivism is based on the assumption that there are universal laws that govern social events, and therefore uncovering these laws enables the researcher to describe, predict and control social phenomena. In this study, the researcher aims at discovering the reality on the status of integration of adaptive technology for visually impaired student teachers in instruction, in primary teacher training colleges in Kenya.

Mixed method neutralizes bias and converge the results, (Creswell, 2003). Jayaratne (1993) asserts that quantitative data will support explicitly the meaning of qualitative research. Wilson (1991) says that qualitative and quantitative data are turning ideas around by providing fresh insights. The close-ended questions in the tools of research formed content of quantification and open-ended questions which mainly sought for opinions on issues of integration of adaptive technology devices for VI student teachers

was explained qualitatively. The integration of the mixed methods within the same study was done to complement each other (Caracelli & Greene, 1997).

### 3.2.1 Quantitative Approach

Quantitative approaches refer to the study of population and samples using numeric data and statistical analysis, Metens (1998). The use of quantitative methods allows collection of facts and study of relationship of one set of facts to another and simple descriptive analysis or more sophisticated predictions, significance testing, strength of relationship and other complex types of analysis (Norton & Pen, 2000). Quantitative research methods are based on rationalistic; empiricist philosophies that reflect a deterministic philosophy in which causes probably determine effects or outcomes" (Creswell, 2003).

Quantitative research may be applied to the social world on the assumption that the social world can be studied in the same way as the natural way, that there is a method for studying the social world that is value free, and that explanation of a causal nature can be provided (Mertens, 2005).This study used quantitative approach in order to inform on the sample size of the respondents, quantify categorization of respondents and present the frequencies and percentages in order to understand the differences which may emanate in the descriptive statistics on aspects of integration of adaptive technology for VI student teachers in instruction in primary teachers training colleges in Kenya.

### 3.2.2 Qualitative Approach

Qualitative research relies heavily on verbal data, collection of detailed narrative description, analysis and interpretation of phenomena, which gives room for subjective analysis (Mertens, 1998). This approach lends itself to the ontological assumption, which is associated with constructivists paradigm understanding of multiple realities existing that are time and context dependent. This paradigm portrays the world as having been

socially constructed, complex and ever changing with no single reality apart from our perception. Qualitative research study therefore views things in their natural setting while attempting to interpret phenomena in terms of the meaning people attach to them (Denzen & Lincoln, 1998).

Cohen and Manion (1994) say that qualitative approach is the understanding of "the world of human experiences". This is because reality is socially constructed. Thus emphasis is laid on the fact that social reality is viewed and interpreted by the individual according to the ideological positions one possesses (Meyers & Hansen 2002). Essentially, qualitative research methods were developed in the social sciences to enable researchers to study social and cultural phenomenon. Assessment of integration of adaptive technology devices for VI student teachers in instruction in primary TTC was easily explained by using this approach since it is a human experience, a social phenomenon. Responses explained the situation of the study in the primary TTC.

## 3.3 Research Design

A research design is the basic plan for a piece of research. This includes the strategy, question of who and what is to be studied, and the tools to be used for collecting and analyzing data (Punch, 2011).The research design was descriptive survey. The purpose of descriptive survey research is to provide a picture of a condition or phenomenon, Boudah (2011:153) says:

> In descriptive research in the field of education, the researcher usually creates and administers a written survey/questionnaire or interview; documents responses; analyzes the data; and describes the nature of participant attitudes, beliefs, or behaviours based on the responses.

This kind of research was chosen because it answered questions concerning the status in this case, integration of adaptive technology in instruction of VI student teachers with

regard to availability and use of adaptive technology devices, the training of tutors and the attitude of tutors on integration of adaptive technology and VI student teachers towards these. The college administration support in integration of adaptive technology for VI student teachers was also studied.

## 3.4 Area of Study

The study was carried out in three primary teachers training colleges in Kenya; these were Mosoriot, Machakos and Asumbi. Mosoriot Teachers College is in Nandi County, 36kms from Eldoret town while Machakos Teachers College is located in Machakos County three kilometres from Machakos town. Asumbi Teachers College is located in Homabay County, 50 kms from Kisumu city (Appendix H).These colleges were chosen because VI student teachers had been integrated in these colleges and no other known study of this nature had been conducted on integration of adaptive technology in Primary Teacher Training Colleges in Kenya.

## 3.5 Target Population

The target population consisted of deans of curriculum, heads of department, tutors and VI student teachers in primary TTCs in Kenya with visually impaired student teachers making a total of 261. They were distributed in three primary TTCs in Kenya, which admit VI student teachers. The tutors were included in the study since they were involved in the use of adaptive technology in the classroom. The VI student teachers were required to use adaptive technology and therefore were directly involved in the study. The deans of curriculum and heads of departments were charged with the responsibility of supervising the implementation of the curriculum.

### 3.6 Sample Size and Sampling Procedure

A sample is a small representative of a larger whole, Punch (2011).The sample for the study was drawn from the administrators, tutors and VI student teachers in primary TTCs in Kenya which admitted VI student teachers. Purposive sampling technique was used to select three Deans of Curriculum. According to Newman (2011), purposive sampling allows a researcher to select cases that have the required information with respect to the objectives of the study. Purposive sampling also enables the researcher to use ones judgment on the choice of respondents that will enable the research questions to be answered (Nachmias & Nachmias 2009). Deans of curriculum supervised the implementation of educational innovations and thus had the required information on integration of adaptive technology for VI student teachers.

Simple random sampling technique is a method where a researcher uses a purely random sampling process to select cases so that each sampling element in the population will have an equal opportunity of being elected (Newman, 2011). In this study, simple random sampling was used to select nine heads of departments. These were 3 out of 5 from each college and 93 tutors such as 1 from the three primary TTCs colleges used in the study. Census was used to select all the 41 VI student teachers from the three primary TTCs. The VI student teachers consisted of 28 totally blind students and 13 low vision student teachers. This gave a total of 146 respondents which was over fifty percent of the target population which is 261. This was adequate for the study according to Kerlinger (1983). The sampled respondents are shown in Table 3.1.

Table 3.1*Sampled Respondents*

| College | DoC | HoD | Tutors | Low vision student teachers | Blind student teachers | Total |
|---|---|---|---|---|---|---|
| Machakos | 1 | 3 | 31 | 9 | 15 | 59 |
| Mosoriot | 1 | 3 | 31 | 1 | 6 | 42 |
| Asumbi | 1 | 3 | 31 | 3 | 7 | 45 |
| Total | 3 | 9 | 93 | 13 | 28 | 146 |

**3.7 Data Collection Instruments**

The instruments used for data collection in this study were questionnaire for tutors, interview schedule for Deans of Curriculum and Heads of Departments, focus group interview for visually impaired students and observation checklist to check available and unavailable resources in the selected primary teachers training colleges.

**3.7.1 Questionnaire**

A questionnaire is a set of questions asked in order to collect data so as to help answer the research questions (Punch, 2011:62). In descriptive research, questions are designed to yield information for the researcher about the reality being studied (Boudah, 2011:161).

A questionnaire was used by the researcher since it gives the respondent adequate time to give well thought answers, (Wiersma & Jurs 2005). Being a standard research instrument, it allows for uniformity in the manner in which questions are asked and makes it possible to be compared across respondents (Cohen & Manion, 2003). The researcher developed a questionnaire which was used to get information from tutors in primary TTCs (appendix A) on integration of adaptive technology in the teaching of VI student teachers.  Part i) had bio-data information; part ii), iii), iv) and v) had questions which called for responses on  likert scale designed to collect information about status of integration of adaptive technology in the teaching of VI student teachers.

The researcher visited the three primary TTCs and in each college administered the questionnaire personally to the tutors. This gave the researcher a chance to explain the importance of the study and why it was being conducted. The researcher then distributed the questionnaires (appendix A) and waited for the tutors to fill them. Upon completion, the questionnaires were collected immediately by the researcher so as to avoid any loss or delay in postage. A total of 93 questionnaires were distributed to the selected primary teachers training colleges and all were returned. This gave a return-rate of 100%.

### 3.7.2 Interview Schedule

An interview schedule is a set of questions to be answered by the subjects of the study orally (Fraenkel & Wallen 2003). According to Wiersma and Jurs (2005:186), the use of an interview has the following advantages; there is no problem with non response, there is in-depth probing, elaboration and clarification of terms, and completion of the survey can be standardized. The researcher used a standardized open-ended interview schedule for deans of curriculum and heads of departments (appendix C). Questions were determined by the researcher but the responses varied depending on the individuals. The interview schedule was administered to the deans of curriculum and heads of departments in the selected primary TTCs to seek information on integration of adaptive technology for VI student teachers.

The researcher visited the three primary TTCs and booked appointments through the principals with the deans of curriculum and heads of departments for interviews. On the material day, the researcher personally conducted interviews with the respondents in each college. A total of three deans of curriculum and nine heads of departments were interviewed. Their responses were written in the spaces provided in the standardized open-ended interview schedule (appendix C).

### 3.7.3 Focus group Interview Schedule

A focus group interview is an interview with a small group of people who are asked to think about questions asked by an interviewer. Fraenkel and Wallen (2003).The respondents sit together and listen to each other's responses. The object is to get at what they think about the issue. The researcher developed a focus group interview schedule (appendix B) for visually impaired student teachers. Focus group interviews lasted for between one hour and one hour fifteen minutes. The researcher was the moderator allowing for free discussions.

The researcher visited the three primary TTCs and booked appointments through the principals with the VI student teachers for interview. On the material day, the researcher personally conducted focus group interviews with the respondents in each college. A total of 41 visually impaired student teachers were interviewed in three groups. Their responses were written in the spaces provided in the standardized open-ended interview schedule (appendix B).

### 3.7.4 Observation Checklist

According to Fraenkel and Wallen (2003), certain kinds of research questions can best be answered by observing how things look. In order to ascertain availability of adaptive technology devices, the researcher developed an observation checklist (appendix D) for the available adaptive technology devices in the selected primary TTCs.

The researcher observed the available adaptive technology devices for VI student teachers in the selected primary TTCs and recorded in the observation checklist (appendix D).

### 3.8 Validity and Reliability of Research instruments

### 3.8.1 Measurements of Research instruments for Quantitative data

### 3.8.1.1 Validity

Validity is the extent to which a measuring instrument provides adequate coverage of the topic under study and measures what it is supposed to, (Kothari 1992:91). Validity is the degree to which the researcher truly measures the construct of focus in the study (Boudah, 2011). The construct of focus in this study was integration of adaptive technology for VI student teachers in instruction in primary TTCs in Kenya. The components of the construct were availability and use of adaptive technology devices for VI student teachers, tutor training on integration of adaptive technology for VI student teachers, and the attitudes of tutors and VI student teachers towards adaptive technology for VI student teachers. Content validity is the degree to which the content in the instrument is an adequate sample of the domain of content it is supposed to represent. It also includes the format of the instruments e.g. clarity of printing, size of type, adequacy of work space, appropriateness of language and clarity of directions (Fraenkel and Wallen (2003). Once developed, the questionnaires, observation checklist and the interview schedules were seen by the teaching staff of Moi University; Department of Curriculum, Instruction and Educational Media where corrections were made, suggestions and advice were used as a basis in modifying the research instruments and making them adequate to the study. This ascertained the content and construct validity of the instruments as per the suggestion by Fraenkel and Wallen (2003).

### 3.8.1.2 Reliability

Reliability refers to the consistency of the research instruments (Wiersma & Jurs 2005). After developing the questionnaires, the researcher sent it out for pilot testing in one of the institutions with VI student teachers that was not involved in this study. Newman

(2011) asserts that it is best to pilot test survey interviews and questionnaires prior to implementation. This will ensure that research instruments function well. It will provide researchers with experiences on how to use the research tools and thus infuse them with confidence (Saunders, Lewis & Thornhill, 2003). Questionnaires for tutors and VI student teachers were presented to the respondents once. After receiving the completed questionnaires; the researcher subjected them to Cronbach coefficient alpha. The researcher found 0.80 coeficiency and the questionnaire was taken to be reliable and fit for use in the study since (Boudah, 2011) stresses that researchers use measures that have a reliability coeficiency of 0m.80 or better. This implied that there was a high degree of reliability of the data.

**3.8.2 Measurements of Research Instruments for Qualitative Data**

According to Lincoln & Guba, (1985) the reliability of qualitative research can be determined through evaluation based on two primary criteria; *trustworthiness* and *authenticity.* Trustworthiness consists of four criteria; *Credibility* (parallel to internal validity), *Transferability* (parallels external validity), *Dependability* (parallels reliability) and *Conformability.* Authenticity was concerned with fairness based on ontological authenticity, educative authenticity, catalytic authenticity and tactical authenticity (Bryman, 2004). Trustworthiness of the qualitative data and findings were determined by collecting detailed descriptive data and developing a detailed description of the context that permit comparison of the context to other possible contexts (Gay,et, al., 2006). By relying on various sources of data through triangulation the researcher was able to collect comprehensive data to support this research.

**3.9 Data Collection Procedures**

The researcher got the introductory letter from Moi University to facilitate in the acquisition of the permit which was obtained from the Ministry of Education so that research could commence. The permit (Appendix I) was used to secure permission from the County Commissioner, the County Director of Education and Principals of selected colleges which enabled the researcher access the target respondents from the primary TTCs. The researcher notified the primary TTC principals by means of letters of the researcher's intention to carry out research in their colleges on integration of adaptive technology for VI student teachers in instruction (Appendix E). Data was collected by means of a questionnaire, interview schedules and observation checklist developed by the researcher for administrators, tutors and VI student teachers in the primary TTCs.

**3.10.1 Quantitative Data Analysis**

With the aid of Statistical Package for the Social Science (SPSS) descriptive statistical methods were used to analyze and present the results. To analyze objective one, descriptive data analysis was employed whereby frequencies and percentages were calculated on the types and use of adaptive technology devices instruction of visually impaired student teachers. To achieve objective two an in-depth analysis provided information on tutor training on integration of adaptive technology for visually impaired student teachers. To achieve the third and fifth objectives, descriptive data analysis was employed whereby frequencies and percentages were calculated on the tutors' attitudes towards integration of adaptive technology for visually impaired student teachers and college administration's support.

### 3.10.2 Qualitative Data Analysis

The data was categorized from the transcripts by creating labels and codes. The labeled and coded data from the interviews, and focus group interviews were synthesized into key concepts/themes and interpreted by identifying their meaning and implication. This was used to answer objective four on the visually impaired student teachers perception of integration of adaptive technology for student teachers.

### 3.11 Ethical Considerations

Following clearance from Moi University Department of CIEM and forward receipt of permit from the MOEST a visit to the selected primary TTCs was made. At the primary TTCs visited clearance from the principal's office was sought with the intentions of carrying out research. The principal directed Dean of Curriculum where the researcher explained the intention of the study. The researcher took time to explain to the respondents the importance of the study and requested them to participate voluntarily. The respondents were assured of confidentiality of the information they would give and that their names would not be revealed. The researcher also would provide respondents with findings from the study through publication after data had been collected and analyzed so as to clear any misconceptions that may have been developed (Fraenkel & Wallen, 2003).

### 3.10 Chapter Summary

The chapter has presented research methodology, research design, area of study, population and sampling procedure, data collection instruments, validity and reliability of instruments, data collection procedures and data analysis.

**CHAPTER FOUR**

**DATA PRESENTATION, ANALYSIS, INTERPRETATION, AND DISCUSSION**

**4.0 Introduction**

This chapter presents, analyse, interprets and discusses the data collected on the integration of adaptive technology in instruction of visually impaired student teachers in primary TTCs in Kenya which was the focus of this study. The instruments used for data collection in this study were questionnaire for tutors, interview schedule for Deans of Curriculum and Heads of Departments, focus group interview for visually impaired students and observation checklist to check available resources in the selected primary TTCs. The chapter presents data on the responses to the five research questions which were:

i)   What types of adaptive technology devices for VI student teachers were available and used for integration in   instruction in primary TTCs?

ii)  What was the state of tutor training on the integration of adaptive technology for VI student teachers in instruction in primary TTCs?

iii) What were the tutors' attitudes towards integration of adaptive technology for VI student teachers in instruction in primary TTCs?

iv)   What were the VI student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs?

v)  What support was provided by the college administration in the integration of adaptive technology for VI student teachers in instruction in primary TTCs?

Data was analyzed using descriptive statistics. From the questionnaires, individual responses were tallied, totalled then converted into the percentage of the study sample then tabulated. The questions were analyzed and discussed on an item by item basis and the findings tabulated. In the tables, the frequencies and the proportions in terms of percentages were shown. The findings are presented in several sections. The first section looks at the background information of the respondents. The second section presents and analyzes availability and use of adaptive technology devices for VI student teachers for Integration in instruction in Primary TTC. The third section contains information on tutor training on the integration of adaptive technology for VI student teachers in instruction in Primary TTCs. The fourth section contains information on the tutors' attitude on the integration of adaptive technology in instruction in Primary TTCs in Kenya. The fifth section contains data on VI student teachers' perception of integration of adaptive technology for VI student teachers in Primary TTCs. The last section presents information on the College administration's support in the integration of adaptive technology for VI student teachers in Primary TTCs.

## 4.1 Background Information of respondents

It was necessary to get background information of respondents. This is because from this information was gotten on tutors' qualification and teaching experiences which affected integration of adaptive technology devices.

### 4.1.1 Gender

Data on the respondents' gender was captured by this study. The responses are as summarized in Table 4.1.

Table 4.1*Gender of Respondents*

| Gender | Deans of Curriculum | | Heads of Department | | Tutors | | VI Student Teachers | |
|--------|-----|------|-----|------|-----|------|-----|------|
| | F | % | F | % | F | % | F | % |
| Female | 2 | 66.7 | 5 | 55.6 | 50 | 53.8 | 18 | 43.9 |
| Male | 1 | 33.3 | 4 | 44.4 | 43 | 46.2 | 23 | 56.1 |
| Total | 3 | 100 | 9 | 100 | 93 | 100 | 41 | 100 |

It is evident from Table 4.1 that majority (66.7%, 55.6%, 53.8% & 43.9%) were female whereas the remaining (33.3%, 44.4%, 46.2%&56.9%) were male.

## 4.1.2 Academic Qualifications

It was important to find out the academic qualifications of the respondents to establish its influence on the integration of adaptive technology for visually impaired (VI) student teachers. According to Cara & Coulon (2000), better qualified teachers have learners who make more progress. Table 4.2 shows the responses of deans of curriculum, heads of departments and tutors.

Table 4.2: *Academic Qualifications of Respondents*

| Qualification | Deans of Curriculum | | Heads of Department | | Tutors | |
|---------------|-----|------|-----|------|-----|------|
| | F | % | F | % | F | % |
| Doctorate | 0 | 0.0 | 0 | 0.0 | 1 | 1.1 |
| Masters | 2 | 66.7 | 3 | 33.3 | 32 | 34.4 |
| Bachelors | 1 | 33.3 | 6 | 66.7 | 58 | 62.3 |
| Diploma | 0 | 0.0 | 0 | 0.0 | 2 | 2.2 |
| **Total** | **3** | **100** | **9** | **100** | **93** | **100** |

As shown in Table 4.2, Majority of the Deans of Curriculum 66.7 %( 2) had masters degrees while 33.3 % (1) had bachelor degrees. This implies that they had made an effort to advance in their studies so as to be skilled in Education Administration. Table 4.2 further indicates that 33.3% (3) of the heads of department had masters degrees while the remaining 66.7 % (6) had bachelor degrees. With regard to tutors, 62.3% (58) of them held bachelors degree, 34.4% (32) had masters while the remaining 2.2% (2) were diploma holders. This maybe explained by the fact that the entry requirement for one to teach at the primary teachers college is a bachelor's degree except for technical subjects like computer studies which is not examinable by Kenya National Examinations Council.

### 4.1.3 Teaching Experience

It was important to find out the teaching experience of the deans of curriculum, heads of department and tutors involved in the study. This is because teaching experience has been seen by other researchers as influencing adaptation to innovation in education. Usually tutors with considerable years of work experience are used to traditional methods of teaching and may not be ready to embrace change, as compared to tutors with fewer years of experience (Peralta & Adriano, in press). On the other hand, Rice (2010) on the impact of teacher experience states that experience promotes effectiveness. This shows the importance of teaching experience on integration of adaptive technology devices on visually impaired student teachers. Respondents were asked to state their years in the teaching profession and the responses are summarized in Table 4.3.

Table 4.3: *Experience in the Teaching Profession*

| Teaching Experience in Years | | | Less than 5 years | 6-10 years | 11-15 years | More than 15 years | Total |
|---|---|---|---|---|---|---|---|
| | Deans of Curriculum | F | 0 | 0 | 1 | 2 | 3 |
| | | % | 0.0 | 0.0 | 33.3 | 66.7 | 100 |
| | Heads of | F | 0 | 0 | 2 | 7 | 9 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| In the Teaching Profession | Department Tutors | % | 0.0 | 0.0 | 22.2 | 77.8 | 100 |
| | | F | 7 | 11 | 16 | 59 | 93 |
| | | % | 7.5 | 11.8 | 17.2 | 63.5 | 100 |
| | Deans of Curriculum | F | 0 | 1 | 2 | 0 | 3 |
| | | % | 0.0 | 33.3 | 66.7 | 0 | 100 |
| | Heads of Department | F | 0 | 4 | 3 | 2 | 9 |
| In Primary TTC | | % | 0.0 | 44.5 | 33.3 | 22.2 | 100 |
| | Tutors | F | 26 | 37 | 15 | 15 | 93 |
| | | % | 28.0 | 39.8 | 16.1 | 16.1 | 100 |

**4.1.3.1 Number of years in the teaching profession**

The deans of curriculum had been in the teaching profession for more than five years. 33.3 % (1) of them had been in the teaching profession for 11 to 15 years while, 66.7 % (2), more than 15 years. With regard to Heads of Department 22.2% (2) had taught for 11 to 15 years. A majority of 77.8% (7) Heads of Department had taught for more than 15 years. As indicated in the table above, 63.5% (59) of the tutors indicated that they had an experience of more than 15 years in the teaching profession while 17.2% (16) had 11 to15 years and 11.8 % ( 11) 6 to 10 years respectively. Only 7.5% (7) had an experience of less than 5 years. From the results, majority of the respondents had an experience of over 10 years hence they understood the curriculum and the challenges in the primary TTCs and this would be important in spearheading the integration of adaptive technology for visually impaired (VI) student teachers in instruction in primary teacher training colleges. Further more, teachers' qualification and experience as represented by the number of years of teaching influences students academic achievement (Snowman and Biehler, 2000).

**4.1.3.2 Number of Years taught in Primary TTCs**

Respondents were asked about the number of years they had taught in primary teacher training colleges. Findings are presented in the table 4.3.According to the Deans of Curriculum, 33.3 % (1) had been at primary TTC for between 6 and 10 years while

66.7% (2), 11 to 15 years. The responses of the Heads of Department showed that, 44.5% (4) had taught at the primary TTC for six to 10 years while 33.3% (3) for 11 to 15 years. A minority of 22.2% (2) had taught for more than 15 years at the primary TTC. Table 4.3 further reveals that 39.8% (37) of tutors had taught for six to 10 years, 28.0% (26) had an experience of less than five years while the remaining equal proportion of 16.1% (15) had taught in primary teacher training college for between 11to15 years and more than 15 years respectively. The experience from majority of the tutors shows that 72.0 % (67) have been teaching for over six years in primary TTC. This implies that they were present when the visually impaired student teachers were first admitted in primary TTCs thus were in a better position to give us the state of affairs with regard to integration of adaptive technology for visually impaired student teachers during instruction.

### 4.1.3.3 Number of years teaching VI student teachers

With regard to the number of years teaching the Visually Impaired Student teachers, responses were summarized in Table 4.4

Table 4.4 *Number of years teaching VI student teachers*

| Number of years teaching VI Student Teachers | Heads of Department | | Tutors | |
|---|---|---|---|---|
| | F | % | F | % |
| Less than 5 years | 0 | 0.0 | 35 | 37.6 |
| 6-10 years | 9 | 100 | 58 | 62.4 |
| 11-15 years | 0 | 0.0 | 0 | 0.0 |
| More than 15 years | 0 | 0.0 | 0 | 0.0 |
| Total | 9 | 100 | 93 | 100 |

From the findings, all the Heads of Department had taught the visually impaired student teachers for six to 10 years. Majority 62.4% (58) of the tutors had been teaching in VIS for between six to 10 years, 37.6% (35), less than five years. This implies that all the Heads of Department and majority of the tutors had taught visually impaired student teachers for more than six years thus were experienced and able to comment on integration.

### 4.1.3.4 Teaching subjects

The Heads of Department and tutors were asked to give their teaching subjects in the primary teachers training colleges and their responses were captured in Table 4.5

Table 4.5: *Teaching subjects*

| Subject Taught | Heads of Departments | | Tutors | |
|---|---|---|---|---|
| | F | % | F | % |
| Maths | 2 | 22.3 | 10 | 10.8 |
| English | 1 | 11.1 | 16 | 17.2 |
| Kiswahili | 0 | 0.0 | 15 | 16.1 |
| Science | 1 | 11.1 | 7 | 7.5 |
| Agriculture | 0 | 0.0 | 4 | 4.3 |
| Home science | 1 | 11.1 | 4 | 4.3 |
| H.P.E | 1 | 11.1 | 6 | 6.5 |
| Social studies | 1 | 11.1 | 7 | 7.5 |
| CRE | 0 | 0.0 | 6 | 6.5 |
| IRE | 0 | 0.0 | 1 | 1.1 |
| ICT | 0 | 0.0 | 3 | 3.2 |
| Art | 1 | 11.1 | 3 | 3.2 |
| Education | 1 | 11.1 | 9 | 9.7 |

| | | | | |
|---|---|---|---|---|
| Music | 0 | 0.0 | 2 | 2.2 |
| Total | 9 | 100 | 93 | 100 |

From Table 4.5, 22.3 % (2) of the Heads of Department taught Maths. An equal proportion of 11.1% (1) taught English, Science, Home Science, H.P.E, Social Studies, Art and Education respectively.

Results in Table 4.5 further reveal that 17.2 % (16), 16.1% (15) and 10.8 % (10) tutors indicated English, Kiswahili and Math respectively as their teaching subjects. Another 9.7 % (9) taught education while 7.5% (7) were specialized in social studies and an equal proportion of 6.5 % (6) taught C.R.E and H.P.E. respectively. Another equal proportion of 6.5% (6) of 4.3% (4) were agriculture and home science tutors and similarly equal percentages of 3.2% (3) were tutors of ICT and Art respectively. Only 2.2% (2) and 1.1% (1) taught music and I.R.E respectively. It is clear that all the subjects taught at the Primary TTCs were fully represented in the study hence the ideas from different departments were captured.

### 4.1.3.5 Students' Cohorts taught by tutors and Heads of Departments

Students' cohorts taught by tutors and Heads of Departments were established and the responses summarized in Table 4.6

Table 4.6: *Student Cohort taught by tutors and Heads of Departments*

| Student cohort | Heads of Departments | | Tutors | |
|---|---|---|---|---|
| | F | % | F | % |
| 1st years | 1 | 11.1 | 19 | 20.4 |

| | | | | |
|---|---|---|---|---|
| 2nd years | 1 | 11.1 | 21 | 22.6 |
| 1st and 2nd years | 7 | 77.8 | 53 | 57.0 |
| Total | 9 | 100 | 93 | 100 |

Majority of the Heads of Departments 77.8 % (7) taught both first and second years while an equal proportion of 11.1 % (1) taught first years and second years respectively. It is clear from Table 4.6 that 57% (53) tutors taught first and second years while 22.6% (21) taught second years and the remaining 20.4% (19) taught first years. This shows that tutors and Heads of Departments who taught both cohorts were represented in the study i.e. first and second years.

## 4.2 Availability and Use of Adaptive Technology Devices for VI student Teachers for Integration in Primary TTC.

Adaptive Technology Device refers to any product, device or equipment whether acquired commercially, modified or customized that is used to maintain, increase or improve the functional capabilities of individuals with disabilities. The adaptive technology devices are used in order to help the visually impaired access the curriculum. Adaptive technology devices used for teaching VI student teachers during instruction are varied and should be provided for use during instruction. The study sought to find out from the respondents whether the adaptive technology devices were available and in use in their primary teachers training colleges. Table 4.7 summarizes the responses.

Table 4.7: *Tutors' responses on availability and use of Adaptive Technology Devices for VI student teachers for Integration in Primary TTC.*

| Adaptive Technology Device | Available and in use | | Not available | | Available and not in use | | Total | |
|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % |
| Tactile diagrams | 47 | 50.5 | 45 | 48.4 | 1 | 1.1 | 93 | 100 |
| Tactile maps | 40 | 43.0 | 49 | 52.7 | 4 | 4.3 | 93 | 100 |
| Tactile globe | 14 | 15.1 | 78 | 83.9 | 1 | 1.1 | 93 | 100 |
| Braille machines | 84 | 90.3 | 7 | 7.5 | 2 | 2.2 | 93 | 100 |
| Braille clock | 9 | 9.7 | 83 | 89.2 | 1 | 1.1 | 93 | 100 |
| Large print texts | 70 | 75.3 | 21 | 22.6 | 2 | 2.2 | 93 | 100 |
| Brailed textbooks | 53 | 57.0 | 37 | 39.8 | 3 | 3.2 | 93 | 100 |
| Screen readers | 25 | 26.9 | 64 | 68.8 | 4 | 4.3 | 93 | 100 |
| Tape recorded texts | 41 | 44.1 | 51 | 54.8 | 1 | 1.1 | 93 | 100 |
| Real objects | 52 | 55.9 | 41 | 44.1 | 0 | 0.0 | 93 | 100 |
| Talking tablets | 13 | 14.0 | 80 | 86.0 | 0 | 0.0 | 93 | 100 |
| Highlighters | 15 | 16.1 | 74 | 79.6 | 3 | 3.2 | 93 | 100 |
| Magnifiers | 37 | 39.8 | 52 | 55.9 | 4 | 4.3 | 93 | 100 |
| Telescopes | 9 | 9.7 | 82 | 88.2 | 2 | 2.2 | 93 | 100 |
| Slate and stylus | 35 | 37.6 | 56 | 60.2 | 1 | 1.1 | 93 | 100 |
| Closed circular television | 0 | 0.0 | 0 | 0.0 | 93 | 100 | 93 | 100 |
| Braille note takers | 0 | 0.0 | 93 | 100 | 0 | 0.0 | 93 | 100 |
| Computer screen magnifiers | 0 | 0.0 | 93 | 100 | 0 | 0.0 | 93 | 100 |
| Descriptive video services | 0 | 0.0 | 93 | 100 | 0 | 0.0 | 93 | 100 |
| Optical character recognition | 0 | 0.0 | 93 | 100 | 0 | 0.0 | 93 | 100 |

It can be observed from the Table 4.7 that 50.5% (47), 48.4% (45) and 1.1% (1) of the respondents stated that the tactile diagrams were available and in use, not available and available and not in use respectively. It is also evident that on the tactile maps 52.7% (49)

indicated that they were not available while 43.0% (40) and 4.3% (4) asserted that they were available and in use and available and not in use respectively.

Further majority 89.3% (78) stated that the tactile globe was not available while only 1.1% (1) said that they were available and not in use. Table 4.7 further reveals that 90.3% (84) had observed that Braille machines were available in use, 89.2% (83) indicated the non-availability of Braille clock while 75.3% (70) asserted that large print texts were available and in use. When asked whether brailed textbooks were available 57.0% (53) observed that they were available and in use, 68.8% (64) stated that screen readers were not available while on the case of tape recorded texts, 54.8% (51) had observed that they were not available while 44.1% (41) stated that they were available and in use. It is also evident that 55.8 % (52) and 42.1% (41) of the respondents asserted that real objects were available and in use and not available respectively. Majority 86.0% (80) stated that talking tablets were not available consequently, it was revealed that 79.6% (74) of the responses showed that highlighters were not available and another 55.9% (52) observed that magnifiers were not available. Similarly, 88.2%(82) and 60.2%(56) of the responses showed that telescopes and slates and stylus were not available in their colleges while all 100%(93) indicated that closed circular television was available and not in use.

 Further all 100% (93) of the respondents asserted that Braille notes takers computer screen magnification, description video services and optical character recognition were not available. This was in line with findings from interviews with the heads of departments and Deans of Curriculum who observed that adaptive technology devices for VI student teachers for integration in primary TTC were inadequate. The few that were available were not sufficiently   utilized. Tactile diagrams, maps, and Braille machines were available and in use. Braille machines were used by the VI student teachers when writing notes in class while tactile diagrams and maps were used by some tutors during

instruction. They further confirmed that large print texts, brailed textbooks and magnifiers, were available but inadequate. However, the Primary Teacher Education revision books had not been transcribed into Braille. This, they said, made the VI students request the sighted students to read the textbooks loudly for them to hear which was not convenient. With regard to the tactile globes, Braille clock, tape recorded texts, talking tablets, highlighters telescopes, slate and stylus, Braille note takers, closed circular television, computer screen magnification, description video services and optical character recognition, the heads of departments and Deans of Curriculum said that  they were not available and therefore not in use. Computers are of great significance in the teaching and learning of visually impaired student teachers. According to Dell et al. (2012), computers are also delivered with various adaptive technology devices to support students with visual impairments, for instance screen magnification, increasing the size of the mouse pointer, and the ability to convert text to speech.

A computer's role in instructional process cannot be undermined since learners are actively involved in benefiting from the information in superhighway. This could be in words, games, graphics, numbers, ideas, records or messages.  They can be used to store, retrieve, manipulate, transmit and receive information electronically in digital form (Agumba et al, 2009).Visually impaired student teachers may have missed out on this since computer applications were not available in the primary TTCs studied. Devices such as the Braille note taker that combines Braille with computer technology have made Braille much more useful than it was in the past, Hasselbring and Glazer (2000).This computer technology enables the tutor to mark the visually impaired student teacher's assignments without knowledge on Braille. This is because the technology can convert Braille to text. The student can also listen to what he/she has written which makes learning interesting. According to (Mwaka et al, 2014), teaching and learning materials

are objects intended to be used during the processes of teaching and learning; when studying specific tolpics and achieving specific educational goals defined in syllabuses. They are used to simplify the content being taught. Educational materials are prepared materials intended to be used during the processes of teaching and learning; when studying specific topics and achieving specific educational goals defined in syllabuses.

The findings are similar to what Kiaritha (2011) in her study of implementation of Persons with Disabilities Act (2003) in public universities in Kenya found, that a major challenge was lack of assistive devices for students with disabilities. There was poor provision of special facilities and services. According to the Kenya Constitution, any person with disability is entitled to access materials and devices to overcome constraints arising from the person's disability (RoK, 2010). This may imply that the rights of the Visually impaired students had been flawed. With inadequate adaptive technology devices, the visually impaired student teachers would not be able to access the primary teacher education curriculum content. The researcher also made an observation of all the available adaptive technology devices in the institutions studied using an observation checklist. This was in an attempt to verify findings from the tutors and tutors with regard to the types of available adaptive technology devices and their use. The findings are indicated in Table 4.8.

Table 4.8: *Types of available Adaptive Technology for VI Student Teachers in the Primary TTCs*

| Adaptive Technology Device | Available | | Not Available | | Total | |
|---|---|---|---|---|---|---|
| | F | % | F | % | F | % |
| Tactile diagrams | 2 | 66.7 | 1 | 33.3 | 3 | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tactile maps | 2 | 66.7 | 1 | 33.3 | 3 | 100 |
| Tactile globe | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Braille  machines | 3 | 100 | 0 | 0.0 | 3 | 100 |
| Braille clock | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Large print texts | 3 | 100 | 0 | 0.0 | 3 | 100 |
| Brailed text books | 3 | 100 | 0 | 0.0 | 3 | 100 |
| Screen readers | 2 | 66.7 | 1 | 33.3 | 3 | 100 |
| Tape recorded texts | 2 | 66.7 | 1 | 33.3 | 3 | 100 |
| Real objects | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Talking tablets | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Highlighters | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Magnifiers | 2 | 66.7 | 1 | 33.3 | 3 | 100 |
| Telescopes | 1 | 33.3 | 2 | 66.7 | 3 | 100 |
| Slate and stylus | 3 | 100 | 0 | 0.0 | 3 | 100 |
| Closed circular television | 3 | 100 | 0 | 0.0 | 3 | 100 |
| Braille note takers | 0 | 0.0 | 3 | 100 | 3 | 100 |
| Computer        screen magnification | 0 | 0.0 | 3 | 100 | 3 | 100 |
| Descriptive video services | 0 | 0.0 | 3 | 100 | 3 | 100 |
| Optical character recognition | 0 | 0.0 | 3 | 100 | 3 | 100 |

Table 4.8 presents an analysis of availability of Adaptive Technology for VI Student Teachers in the Primary TTC's as per the observation schedule. With regard to tactile diagrams and maps, they were available in 66.7 % (2) institutions and not available in 33.3 % (1) institution. Braille machines and brailed textbooks were present in all the institutions studied, 100% (3).Tactile globe, Braille clock, large print texts, talking tablets and highlighters were available in 33.3 % (1) institution and not available in 66.7 % (2) institutions. Screen readers, tape recorded texts, and magnifiers were available in 66.7% (2) institutions and not in 33.3 % (1) institution. Real objects and telescopes were found in 33.3 % (1) institution and not present in 66.7 % (2) institutions. Closed circular television and  slate and stylus, were available in all 100 % (3) institutions. On the contrary, Braille note takers, computer screen magnification, description video services and optical character recognition were not available in all 100% (3) institutions. These findings show that the available adaptive technology devices are inadequate. The adaptive technology devices should be easily accessible to both students and tutors. Since

the need for school resources is of paramount importance in modern day's educational systems as stated by Chumo (2009). A number of scholars have emphasized that;

1) Adaptive technology devices modify or adapt the classroom for special learning needs.

2) Tactile diagrams, maps &pictures (graphics), greatly enhance the acquisition of the overall picture by the VI students, as well as their experiences.

3) Adaptive technology devices reinforce two-dimensional representations so that it is more accessible to VI students and motivate visually impaired students to learn.

4) Adaptive technologies vary communication options with touch, speech and residual vision.

5) Adapted computer technology gives a way through the lack of sight and facilitates independence by enabling the visually impaired learners to take control over their learning.

(Purcel & Grant, 2002; Songe, 2004 and Agbenyega 2006).

From the above sentiments, adaptive technology can enable the visually student teachers get accustomed to the classroom environment. For instance, when tutors label areas in braille, print, pictures and even objects, visually impaired student teachers are able to locate areas and materials. Willings (2017) explains that incorporating print and/or braille for non-readers and pre-readers will also help promote literacy and encourage independence. Signs should be placed in strategic locations for the student's observation and exploration. Tactile diagrams, maps &pictures (graphics), greatly enhance the acquisition of the overall picture by the VI students, as well as their experiences. In map reading and interpretation, visually impaired student teachers are able to acquire required

skills with tactile maps. Visually impaired student teachers in primary teacher training colleges may have missed this. According to Korir (2015), mixing the students with the visually impaired, had generally improved the public opinion about the handicapped in the society. Students with visual impairment lacked storybooks, poetry books and therefore could never be at par with their peers in terms of reading and learning. The teachers gave an example of a student who due to sickness was given drugs that rendered her loss of sight. This particular student came back to school but she was in denial of her state. She took time to accept her status of being blind due to this attitude became slow in learning to use Braille machine, she developed hatred towards the others who were active in participation in class while answering question something she could do. The student could not see any illustrations on the black board and could not even see the charts being used to teach the other students. Visually impaired students ventured on their own since most of the teachers did not have any experience in handling the visually impaired. These conditions have made teachers feel it is unfair to mix the sighted students with the visually impaired.

Kilel (2012) also established inadequate resources in his study on factors influencing quality training in public primary teachers training colleges. The teaching and learning materials were inadequate and obsolete. Various practical skills needed to be reinforced using the teaching and learning aids which would in turn be applicable during teaching practice and professional actualization. He also noted that the few available up-to-date learning resources were inaccessible.

## 4.3 Tutor training on the Integration of Adaptive Technology for VI student Teachers in Primary TTC's

The study sought to find out information on tutor training on the Integration of Adaptive Technology for VI student teachers in Primary TTCs. This included responses on training in Special Needs Education, rating proficiency in English Braille, frequency of training on preparation of tactile maps and diagrams and expertise in the integration of adaptive technology for VI student teachers during instruction. An adapted syllabus for VI student teachers had been prepared to cater for their needs. The syllabus stressed that the teaching of student teachers who are visually impaired demands that tutors use appropriate resources and be competent in development and production of quality tactile diagrams and maps.

### 4.3.1 Training in Special Needs Education

The tutors were asked whether they had any training on special need education and Figure 4.5 shows their responses.  The aspect of training was captured by this study because of its significance in professional development. It is observed that due to their role in education, teachers at all levels require effective and sufficient education to be able to adequately carry out their roles and responsibilities. Otiende et al (1992) acknowledge that trained teachers are vital for quality education. There was need for the primary TTCs tutors to be trained in special needs education so as to be able to handle student teachers with disabilities.
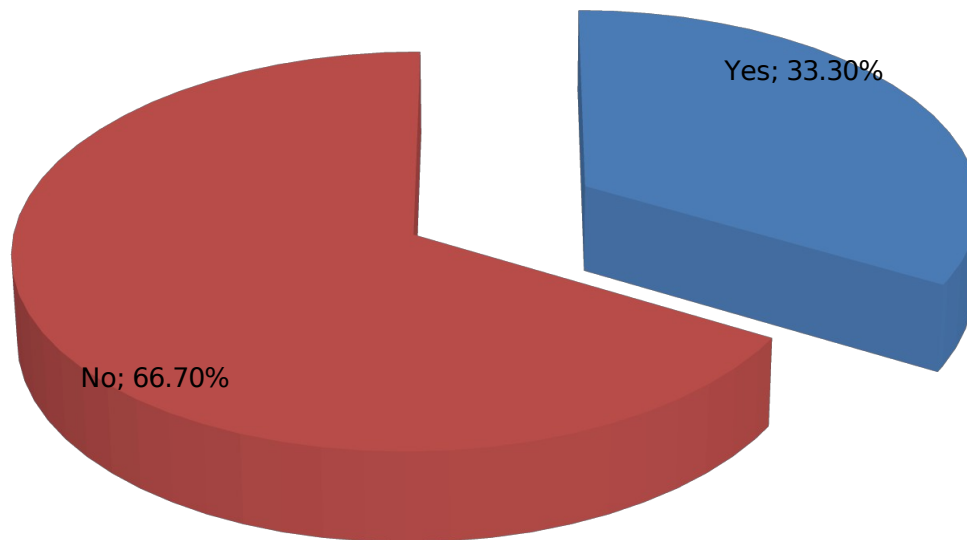
Figure **4.1 Training on Special Needs Education**

Figure 4.1 reveals that 33% (31) had received training on special needs education while 67% (62) had not. This shows that some of them do not have any knowledge on how to deal with the VI student teachers. These findings were in agreement with the results from those realized from interview with the heads of departments and Deans of Curriculum who observed that some training had taken place but still not to the optimum. The interviewees felt that the training should thus be enhanced since once the tutors are familiar with the adaptive technology devices and confident in their use, they are able to see their application within the curriculum. (Technology for Learning: Students with Disabilities, 2000). Teachers should also be supported in developing and sustaining alternative pedagogies and teaching strategies (Dede, 1997). Anderson, Klassen, and Georgiou (2007) and Gronseth (2011) in their studies on barriers to technology implementation pointed out that there was inadequate pre-service and in-service training for regular and special educators. They lacked the knowledge they needed to be more

effective at teaching and dealing with students with special needs. Teacher education, as confirmed by UNESCO (2002), should be transformed in order to support inclusion.

The tutors in primary TTCs needed to have been prepared on how to integrate adaptive technology so as to teach students with special needs.

**4.3.2 Acquisition of Training in Special Needs Education**

Respondents were asked how they had acquired their training in special needs education and Table 4.9 shows the results.

Tables 4.9 *Acquisition of Training in Special Needs Education*

| How training was acquired | F | % |
|---|---|---|
| University course | 20 | 21.5 |
| Provided by PTTC | 4 | 4.3 |
| Acquired privately | 6 | 6.5 |
| Provided by KICD | 1 | 1.1 |
| Not applicable | 62 | 66.7 |
| Total | 93 | 100 |

As shown in Table 4.9, 66.7% (62) indicated that the question was not applicable in their context, 21.5 % (20) indicated university course, 6.5% (6) acquired privately while 4.3% (4) and 1.1% (1) stated that it was provided by TTC and KICD respectively. It is evident that most tutors had received it in universities however; some of them had interests on it and had opted to acquire it privately. This implies that very little had been done to in-service tutors on integration of adaptive technology for visually impaired student teachers.  Koech (2011) opines that in service courses should be developed and mounted for teachers for purposes of upgrading the teachers professionally.  In-service in updating and renewal of knowledge, skills and capabilities are now widely acknowledged as a high priority (MOE, 2009). Teachers need to be motivated by taking part in in-service programs (Kimani, 2011).

### 4.3.3 Rating Proficiency in English Braille

The primary TTC adapted syllabus for visually impaired students asserts that tutors who teach visually impaired students should be proficient in English Braille (KIE, 2005).This would enable the tutors to cater for tactile learners. Therefore it was necessary to rate the respondents in terms of their proficiency in English Braille.
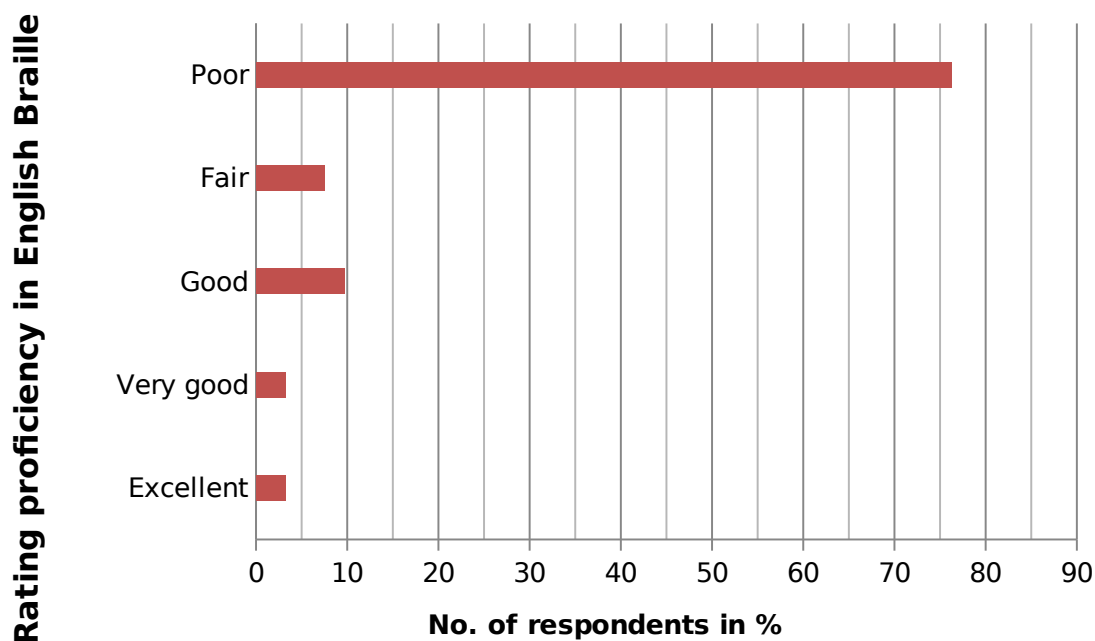
**Figure 4.2 Rating proficiency in English Braille**

It is clear from Figure 4.2 that majority 76.3% had indicated their proficiency as poor, 9.7% good, 7.5% fair and an equal proportion of 3.2% rated it as excellent and very good. More in-service training needs to be given to the tutors to improve their work output. This was in line with findings from interviews with the heads of departments and Deans of Curriculum who observed that very few tutors were proficient in English Braille. This discouraged the tutors from preparing tactile diagrams to be used for illustrations during instruction. Most of the work was done by the braillist who was overburdened. The primary tactile medium used by VI student teachers is the Braille code developed by Louis Braille in 1829.Those teaching learners using Braille should be well trained (Berdin and Blackhurst, 1985). According to the Kenya Constitution, any person with disability is entitled to use Braille (RoK, 2010).Tutors should be proficient in Braille so as to easily communicate with visually impaired student teachers using different media.

### 4.3.4 Frequency of Training on Preparation of Tactile Maps and Diagrams

The primary TTC adapted syllabus for visually impaired students asserts that tutors who teach visually impaired students should be competent in the development and production of quality tactile diagrams and maps. (KIE, 2005). Therefore it was necessary to find out the frequency of training of tutors on preparation of tactile maps and diagrams.

Responses are shown in Figure 4.7
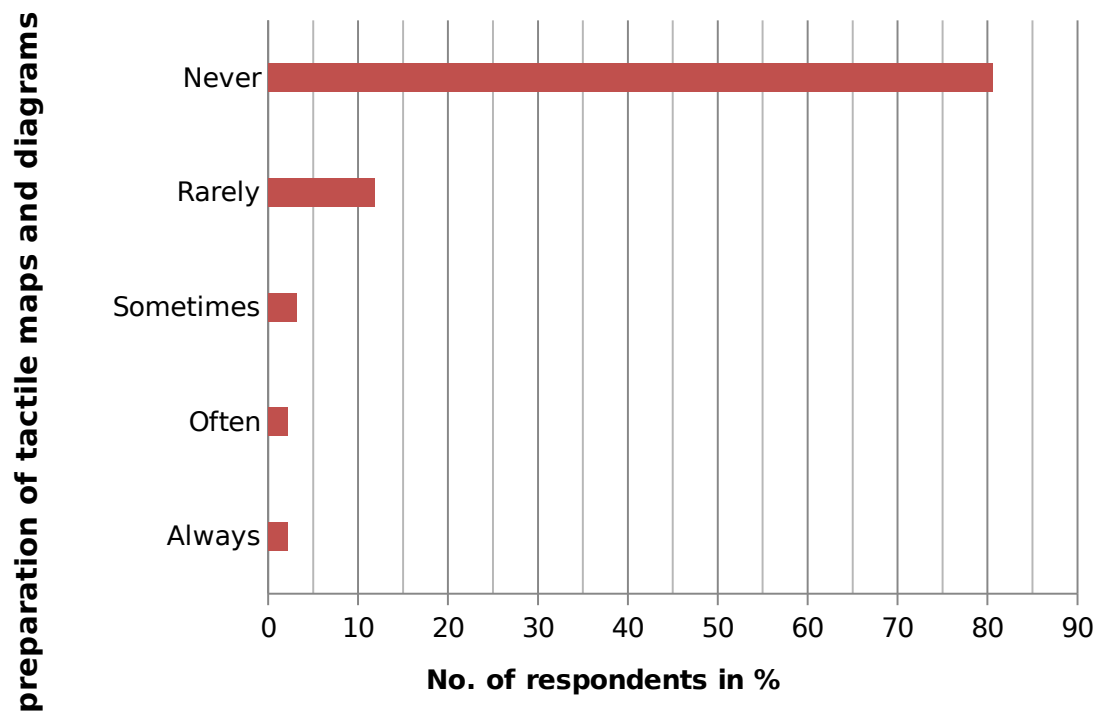


**Figure 4.3 Frequency of training on preparation of tactile maps and diagrams**

Figure 4.3 shows that 80.6% of the respondents stated that they had never had any training, 3.2%, sometimes while an equal proportion of 2.2% stated often and always

respectively. Those who indicated that they rarely trained were 11.8%.This implies that since a large proportion had not been trained on the preparation of tactile maps and diagrams integration of adaptive technology was hampered. For instance in the teaching of phonetic transcriptions in English, the student teacher is supposed to conceptualize the correct pronunciation of words in English using the IPA table to translate spelling of English words into phonetic symbols. This may be difficult for the VI student teacher to conceptualize without the use of a tactile diagram. Map reading and interpretation in Social Studies may also be a challenge since visually impaired student teachers may not be able to conceptualise the directions an and distances being discussed in the classroom. An adapted syllabus for VI student teachers has been prepared to cater for their needs. The syllabus stresses that the teaching of student teachers who are visually impaired demands that tutors use appropriate resources and be competent in development and production of quality tactile diagrams and maps (KIE, 2005). Teacher training and preparation have been noted as a disadvantage of inclusion since teachers may not be adequately trained to provide necessary adaptations for students with disabilities (AFB, 2012). Teachers may not be aware of the most appropriate strategies to use to individualize instruction for students with specific needs. While legislative requirements and reported benefits are pushing more and more children with disabilities into general education settings, some researchers continue to cite apprehension to this model (AFB, 2012).

In-service courses in special needs education should be mounted for all teachers already in the field. This will help minimize negative attitudes and create more positive perception towards children with visual impairment. As teachers become more inclusive practitioners, they are aware of providing quality 'opportunities for the participation of all learners in the class and hence in the school and community' (UNESCO, 2002).

**4.3.5 Expertise in the Integration of Adaptive Technology for VI student Teachers during Instruction.**

The study sought to find out from the respondents on their expertise in the integration of adaptive technology for VI student teachers during instruction. With full integration of adaptive technology for visually impaired student teachers the teachers would be well trained since they would access the curriculum adequately. The tutors were required to rate themselves in terms of their current ability to use the devices. Table 4.10 shows the results.

Table 4.10: *Expertise in the Integration of Adaptive Technology for VI Student Teachers during Instruction*

| Adaptive Technology Device | Poor | | Fair | | Good | | Very good | | Excellent | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Tactile diagrams | 51 | 54.8 | 20 | 21.5 | 14 | 15.1 | 6 | 6.5 | 2 | 2.2 | 93 | 100 |
| Tactile maps | 59 | 63.4 | 15 | 16.1 | 14 | 15.1 | 4 | 4.3 | 1 | 1.1 | 93 | 100 |
| Tactile globe | 66 | 71.0 | 14 | 15.1 | 8 | 8.6 | 5 | 5.4 | 0 | 0.0 | 93 | 100 |
| Screen readers | 66 | 71.0 | 12 | 12.9 | 8 | 8.6 | 5 | 5.4 | 2 | 2.2 | 93 | 100 |
| Braille clock | 66 | 71.0 | 16 | 17.2 | 5 | 5.4 | 4 | 4.3 | 2 | 2.2 | 93 | 100 |
| Tape recorded text | 48 | 51.6 | 19 | 20.4 | 13 | 14.0 | 7 | 7.5 | 6 | 6.5 | 93 | 100 |
| Brailed textbooks | 59 | 63.4 | 16 | 17.2 | 12 | 12.9 | 3 | 3.2 | 3 | 3.2 | 93 | 100 |
| Real objects | 28 | 30.1 | 19 | 20.4 | 20 | 21.5 | 14 | 15.1 | 12 | 12.9 | 93 | 100 |
| Talking tablets | 55 | 59.1 | 15 | 16.1 | 10 | 10.8 | 7 | 7.5 | 5 | 5.4 | 93 | 100 |

According to the results in Table 4.15, 54.8% (51) indicated that they were poor in the integration of tactile diagrams while 21.5% (20) stated that they were fair. A further 15.1 %( 14), 6.5% (6) and 2.2% (2) revealed that they were good, very good and excellent respectively. With regard to tactile maps, 63.4 % (59) and 16.1%(15) showed that they were poor and fair in its use respectively,15.1%(14),4.3%(4) and 1.1%(1) were good, very good and excellent. Majority of the respondents, 71.0 % (66) stated that their proficiency in the use of tactile globes, screen readers and braille clock was poor. Tactile

globes' use was indicated as 15.1 % (14) fair,8.6% (8) good, 5.4%(5) very good and 0.0% (0) excellent. Expertise in the use of screen readers was further indicated as 12.9 % (12) poor, 8.6 % (8) good, 5.4%(5) very good and 2.2%(2) excellent respectively. While with the Braille clock, their expertise was further indicated as 17.2 % (16) fair, 5.4 % (5) good, 4.3%(4) very good and 2.2%(2) excellent.

The study further revealed that 51.6% (48), and 63.4 % (59) indicated their poor ability to use tape recorded texts and brailled textbooks. Another 20.4 % (19), 14.0 % (13), 7.5% (7) and 6.5 % (6) viewed their expertise in the use of tape recorded texts as fair, good, very good and excellent respectively. Brailled textbooks elicited more information on expertise as fair 17.2 % (16),good 12.9% (12), very good 3.2%(3) and excellent 3.2%(3) respectively. With real objects, 30.1% (28) stated their poor ability to use it, 21.5 % (20) good, 20.4% (19) fair and only 15.1%(14) and 12.9% (12) had indicated very good and excellent respectively. On the talking tablets 59.1% (55) responses shows poor ability, 16.1% (15), 10.9 % (10) and 7.6 % (7) indicated fair, good and very good respectively. The remaining 5.4% (5) indicated excellent. The findings indicate that majority of the respondents were poor in integration of adaptive technology for VI student teachers during instruction. This concurs with findings from interviews with the heads of departments and Deans of Curriculum who observed that the level of expertise among tutors in the integration of adaptive technology was extremely low. They further explained that most of the tutors taught VI student teachers the same way as the sighted students. Large prints were only used during examinations.

These findings are similar to what MOEST (2005) explains, that the problem in special education has been inadequate capacity among many teachers to handle learners with special needs. Special educators and related professional personnel need to be aware of

and know how to use various technologies if they are to be maximally effective in helping exceptional learners. They must be able to modify their instructional approaches to accommodate the special needs of students. They need to know how to use adaptive equipment. According to Dakwa (2011), more brailled books should he made available to visually impaired students. There is need to adapt the school environment to accommodate participation of the children with visual impairment in sport. Teachers need to be in-serviced so that they can be equipped with skills to effectively include children with visual impairment

Berdin and Blackhurst (1985) and Agumba et al (2009) state, that it is vital for a teacher to be familiar with a wide range of resources for use because what is finally adopted depends on the competency of the teachers. According to Maheshwari (2014), each student is a unique individual with innate differences in intelligence, differences in social and economic background, variations in past learning experiences, and perhaps variations in the level of congruence between the learner and the curriculum. Therefore, individual differences should be catered for to narrow the gap between individuals and enable them to learn well. To address the needs of students, teachers should provide them with a variety of learning opportunities such as using diversified resources. When teachers modify instruction to accommodate special needs students, all students benefit from the good teaching practices (Bulloch, 2018). Teachers who are not trained properly hinder the rate of learning for students with visual disabilities. This is because teachers of students with visual impairments are supposed to provide specialized instruction and support services for these students, and this instruction should be adequate to compensate for the student's lack of visual functioning. (Silberman, Bruce, & Nelson, 2004).

**4.4 Tutors' Attitude towards Integration of Adaptive Technology for VI Student Teachers in Primary TTCs**

An adapted syllabus for VI student teachers has been prepared to cater for their needs. The syllabus stresses that the teaching of student teachers who are visually impaired demands that tutors posses positive attitudes towards teaching student teachers who are visually impaired. Scardamalia and Bereiter, (2003) assert that teacher attitudes and beliefs are powerful forces which significantly influence actions in the classroom. They also influence professional practice, and thus are crucial factors in the implementation of new technologies (Haney & Lumpe, 1995). The willingness of teachers is also a prerequisite for successful implementation (Pijl & Van Den Bos 2001).

Further, teachers' attitude towards a certain strategy affects their efficiency in teaching. (Wanjala, 2005). This implies that when tutors have positive attitudes towards integration of adaptive technology then they become confident in their teaching and use adaptive technology devices in instruction of visually impaired student teachers. The study sought to find out from the college tutors their attitude towards the integration of adaptive technology for VI student teachers in primary TTC's. They were required to tick the alternative that best expressed the extent of their agreement to the statements. The results are shown in Table 4.11

Table 4.11 *Tutors Attitude towards Integration of Adaptive Technology for VI Student Teachers in Primary TTCs*

| Statement | SA | | A | | UN | | D | | SD | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| Adaptive technology is valuable when teaching | 64 | 68.8 | 21 | 22.6 | 4 | 4.3 | 2 | 2.2 | 2 | 2.2 | 93 | 100 |
| Adaptive technology is easy to integrate in instruction of VIS | 18 | 19.4 | 39 | 41.9 | 14 | 15.1 | 17 | 18.3 | 5 | 5.4 | 93 | 100 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adaptive technology enhances VI student teachers understanding | 56 | 60.2 | 33 | 35.5 | 3 | 3.2 | 1 | 1.1 | 0 | 0.0 | 93 | 100 |
| Adaptive technology is a motivator of VI student teachers | 54 | 58.1 | 33 | 35.5 | 4 | 4.3 | 2 | 2.2 | 0 | 0.0 | 93 | 100 |
| I recommend tutors to be trained on integration of ATD | 73 | 78.5 | 16 | 17.2 | 3 | 3.2 | 1 | 1.1 | 0 | 0.0 | 93 | 100 |
| Teaching VI student teachers using ATD too demanding | 13 | 14.0 | 26 | 28.0 | 25 | 26.9 | 17 | 18.3 | 12 | 12.9 | 93 | 100 |
| I feel uncomfortable teaching VI student teachers using ATD | 10 | 10.8 | 20 | 21.5 | 26 | 28.0 | 19 | 20.4 | 18 | 19.4 | 93 | 100 |
| I am confident using ATD when teaching VI student teachers | 14 | 15.1 | 24 | 25.8 | 25 | 26.9 | 15 | 16.1 | 15 | 16.1 | 93 | 100 |
| Special education teachers are better placed to use ATD | 34 | 36.6 | 37 | 39.8 | 4 | 4.3 | 11 | 11.8 | 7 | 7.5 | 93 | 100 |
| I recommend that teaching VIS teachers using ATD to be optional | 4 | 4.3 | 11 | 11.8 | 16 | 17.2 | 26 | 28.0 | 35 | 37.6 | 93 | 100 |

It is clear from Table 4.11 that 68.8% (64) of the respondents strongly agreed that they feel that adaptive technology is valuable when teaching VI student teachers. Those interviewed also agreed that a positive attitude was necessary in enhancing integration of adaptive technology for VI Student teachers in primary TTC's. This is in agreement with the adapted syllabus for the VI student teachers where tutors are expected to have positive attitudes to students who are visually impaired (KIE, 2005). This has also been stated by other researchers that attitude formation is influenced by perception with regard to a particular object or action (Serem, 2008). The table also shows that 22.6% (21), 4.3 % (4) and 2.2% (2) agreed, were undecided and disagreed respectively.

Further, 60.2% (56), of the respondents strongly agreed that adaptive technology enhances VI student teacher's understanding of the subject content while 35.5% (33) agreed,3.3% (3) were undecided and 1.1% (1) disagreed. The study also revealed that 58.1%(54) strongly agreed that adaptive technology is a motivator of VI student teachers in learning the subject matter while 35.5%(33) agreed, 4.3%(4) were undecided and 2.2%(2) disagreed.78.5%(78) strongly agreed that tutors should be trained on the integration of adaptive technology for VI student teachers while 17.2% (16) agreed, 3.2% (3) were undecided, and 1.1%(1) respectively. On whether they find teaching VI student teachers using ATD too demanding, 28.0% (26) agreed, 26.9% (25) were undecided while 18.3% (17), 14.0%(13) and 12.9% (12) of the respondents disagreed, strongly agreed and strongly disagreed respectively.

They were also asked whether they felt uncomfortable teaching VI students using ATD, 28.0% (26) were undecided, 21.5% (20), 20.4% (19) and 19.4% (18) agreed, disagreed and strongly disagreed respectively. The remaining 10.8% (10) strongly agreed. Further, 26.9% (25), 25.8% (24) and an equal proportion of 16.1% (15) of the respondents were undecided, agreed, disagreed and strongly disagreed that they were confident in using ATD in teaching VI student teachers. Only 15.1% (14) strongly agreed.

The table also shows that 39.8% (37) and 36.6% (34) of the respondents agreed and strongly agreed that they think special education teachers are better placed to use ATD while 11.8% (11), 7.5% (7 ) and 4.3%(4) disagreed, strongly disagreed and were undecided respectively. This implied that the tutors felt insufficient with regard to their skills in adaptive technology. When asked whether they recommend that teaching VI student teachers using ATD should be optional, 37.6% (35), 28.0% (26) and 17.4% (16)

strongly disagreed, disagreed and were undecided respectively. The other 11.8% (11) and 4.3% (4) agreed and strongly agreed respectively. They saw the need for use of adaptive technology for visually impaired student teachers but where not confident due to their incompetence. This may be because they lacked skills in preparation of tactile diagrams and had no knowledge on English Braille. As earlier noted from the theoretical framework, perceived attributes of innovations affected its adoption, Rogers (2003). This implies that the tutors had positive attitudes towards integration of adaptive technology for visually impaired during instruction. But their integration was low since they lacked expertise. Rogers (2003) explains that one of the perceived attributes which influences innovation is complexity. This is the degree to which an innovation is perceived as relatively difficult to understand and used. If the innovation is perceived to be difficult then it is avoided. This may explain the attitudes of tutors who had no confidence in the use of adaptive technology since the lacked expertise. With regard to the perception of teachers, Korir (2015) in a focused group discussion found out that, the teachers' initial perception about students with visual impairment and the program was negative and full of prejudices. After interacting with the visually impaired students, most of the sighted students and their teachers found them to be like any other students. They were as brilliant as the sighted students were. Because of this mixing the visually impaired students with the sighted ones has improved the public image about visually impaired children in the society.

They appreciated the role of adaptive technology devices in enhancing understanding of the subject content. The heads of departments and Deans of Curriculum from the interviews felt that adaptive technology was valuable when teaching VI student teachers since instruction became effective; the students became independent when looking for information. They further added that adaptive technology made the VI student teachers

easily understand concepts and be in touch with what was being taught. A lot of effort has to be put into the inclusive education process since mere familiarity with blind persons does not in itself improve attitudes. The school has to evolve through establishing and adhering to policies, which teachers, administrative staff and students have to uphold. Inclusion fosters the integration of students with disabilities into their parent societies earlier in life and ensures equal opportunities for all students to use resources available in the school and the community, if all ideal resources were put together for the benefit of all students.

The teachers' attitude towards a teaching strategy affects his efficiency in teaching (Wanjala, 2005). Without the correct attitudes in the regular classrooms, inclusion of pupils in regular classroom becomes impossible (Zindi, 2004). Teacher education is pivotal in developing the affirmative attitudes and skills required for successful inclusion. Bortoli (2011) asserts that the high level of education and training in special education resulted in a more positive attitude in teachers toward inclusion. According to Mataruse (2002), the teacher's type of training influences his/her attitude towards children with disabilities. The attitude of specially trained teachers is more positive to special class /unit placement than that of teachers without specialist training. The success of inclusive education depends on teachers' attitudes. This implies that for inclusion to be successful then teachers need to be trained on integration of adaptive technology.

According to Korir (2015), the teachers' perception towards the integrated program, whether positive or negative, was of crucial concern since the teachers formed the immediate company for the students with visual impairment in a school environment. Teachers felt that the students with visual impairment had been made to suffer more by being brought in a regular program. This was because there was little commitment from the government through the ministry of education to boost the students with visual

impairment .The teachers said that there were no trained teaching staff, no special fund, teaching and learning facilities. According to Chireshe (2011), long-serving teachers in programmes related to counselling sometimes suffered from burnout and had more negative attitudes towards those programmes than new teachers. Similarly, familiarity with blind students may not necessarily produce positive attitudes towards them in inclusive schools.  The most important way of translating of policies into practice always was to reallocate resources for staff training and mass procurement of material resources. It was also necessary to move on to the identification of learners who could be serviced from their least restrictive environments.

Greater integration of the visually impaired into classes with seeing children and more training about the capabilities of the visually impaired for regular classroom teachers would result in improved  attitudes towards the visually impaired  and more  appropriate educational planning and placement (Berdin and Blackhurst,1985:257). Chemwei (2013) stresses that; a positive attitude towards innovation generally leads to adoption. Once familiar with the adaptive technology devices and confident in their use, teachers are able to see its application within the curriculum (Bitter and Legacy, 2009). The special education teacher must be able to evaluate instructional materials and select the most effective ones. They must know how to use a variety of instructional materials and individual equipment (Berdine and Blackhurst, 1985). Attitude refers to 'a psychological tendency that is expressed by evaluating a particular entity with some favour or disfavors'. There is a link between attitude and one's evaluation of a given object or state of being. Visually impaired students have the internal self-construct, which makes them have a certain psychological tendency of what other peoples' attitude is towards their state of being visually impaired. (Eagly and Chaiken, 1993). Teachers should also be supported in developing and sustaining alternative pedagogies and teaching strategies

(Dede, 1997). Effective professional development needs to provide time for training, experimentation, and follow-up support (Casey & Rakes, 2002; Levine & Donista-Schmidt, 1998). A teacher should be able to update knowledge on a regular basis to keep pace with the new trends in the profession (Agumba et al 2009:154). According to Gary (1997), Agbenyega (2006), Haralambos and Holborn, (2008) and Yara, (2009), teachers who feel unprepared and fearful to work with learners with disabilities in regular classes, display; frustration, anger and negative attitude towards inclusive education due to the belief that it could lead to lower academic standards. Access to resources and specialist support affects teacher confidence and attitudes toward inclusive education for students with disabilities. Teachers develop and establish various attitudes towards their students, which have a significant effect on their educational attainment. Students' academic performance was negatively affected by the teachers' attitudes during learning processes.

Teachers' lack of confidence due to poor conceptual and phenomenological subject foundations may negatively influence academic performance (Barros and Ellia, 2000). Therefore, teachers need the self-confidence to carry out their duties in demanding unique situations. Peoples attitude tend to evolve as they become more familiar with change. Studies by researchers (Floyd, Smith, Canter, Jeffs & Judge, 2008) indicate that in order for teachers to use adaptive technology in a manner that brings forth a strong, positive impact, they must be confident and well- trained to do so. Kennedy and Deshler (2010) opine that many teachers often reject new tools that may not easily fit within their current approaches to teaching and learning while technology is rapidly changing and evolving.  If technology in inclusive classrooms is to be optimized, Teachers should be informed of technological advances for instruction. Teacher training fosters positive attitudes toward Inclusive Education practices. Many teachers are willing to receive training to improve their knowledge and skills, in order to help children with special

needs (Rakap & Kaczmarek, 2010). According to (Sharmila et al. 2015), attitudes are conceptualized as constructs comprising cognitive, affective and behavioral components. Teachers' attitudes towards inclusion are often based on practical concerns about how inclusive education can be implemented, rather than be grounded in any particular ideology. Common practical concerns raised by teachers include;

1) Accommodating the individualized time demands of students with disability without disadvantaging other students in the classroom.

2)  Being apprehensive of the quality and quantity of work output of children with disabilities.

3)  Lacking adequate support services.

4) Limited training and competence in supporting inclusive educational practice.

Effective change management programs are frequently sequential with early measures directed at overcoming the initial apprehension, denial, anger and resentment but gradually evolve into a program that supports compliance, acceptance and internalization (Agumba et al, 2009). Scardamalia and Bereiter, (2003) assert that teacher attitudes and beliefs are powerful forces which significantly influence actions in the classroom. Teachers tend to develop positive attitude towards students who have neat and clean appearance, those who are known to come from educated families and those who are able to conform to the teacher's own standards Miller (2001).

**4.5 The VI student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs.**

Examining the perception of a target population is a widely used strategy based on the premise that perceptions matter and often influences behaviors. This approach has been used to study faculty perceptions of distance education (Belcheir & Cucek, 2002), and

student perceptions of online learning (O'Malley & McCraw, 1999).Therefore it was necessary in this study to establish the visually impaired student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs.

The researcher personally conducted focus group interviews with the VI student teachers in each selected primary TTC with regard to their perceptions on integration of adaptive technology in instruction in primary TTCs. Focus group interviews lasted for between one hour and one hour fifteen minutes. The researcher was the moderator allowing for free discussions and these were the findings.

## 4.5.1 Availability and use of adaptive technology devices for VI student teachers for integration in instruction in Primary TTCs.

The visually impaired student teachers were asked to state the available adaptive technology devices in their primary TTCs and they gave the following information. Majority of the visually impaired student teachers said that tactile diagrams and maps, slate and stylus were available and in use. Commenting on Braille machines, all of them agreed that they were available and in use. On the other hand the braille clock, talking tablets, highlighters and telescopes were not available and therefore not in use in their primary TTCs. Large print texts, Braille textbooks, screen readers, recorded texts and magnifiers were available but not adequate. They further explained that large prints were only seen during the exams when the low vision student teachers were given exams. Available brailled textbooks, they said, were mainly bibles and a few novels. Braille note takers, computer screen magnification, description video services and optical character recognition were not available and therefore not in use by all the visually impaired student teachers in the selected primary TTCs. These findings implied that the visually

impaired student teachers were not adequately catered for in terms of adaptive technology devices.

### 4.5.2 Proficiency of visually impaired student teachers in English Braille

According to Groff and Mouza (2008), students need to know how to use the technologies embedded in a project in order to achieve success. If the students in a class are not proficient with the tools they will be using, appropriate training should be provided. Thus VI student teachers should be proficient in Braille and be able to use adaptive technology devices. This way, the VI students will understand the concepts taught in different subjects. The study therefore sought to find out proficiency of visually impaired student teachers in English Braille and found out that majority of the visually impaired student teachers were very good. This meant that they could easily use whatever adaptive technology devices they were confronted with.

### 4.5.3 The VI student teachers' perception of the use of Adaptive Technology for VI Student Teachers in Primary TTC's

During the focus group interview, the visually impaired student teachers were asked why they thought adaptive technology was valuable when teaching VI student teachers and they gave the following answers. First, it eased the work by reducing the Braille bulk since information could be stored in computers. Secondly, it enhanced understanding in that the visually impaired students were able to follow the lesson and perceive what was being discussed. They gave the example of a map reading and interpretation lesson in Social Studies. A tactile map would enable a student understand ways of locating places on a map using compass directions, grid references, longitudes and latitudes. The third reason why adaptive technology was valuable according to the visually impaired student teachers was that learning became easier. Notes could be saved and used later because

adaptive technology devices like the computer store data. The VI student teachers also said that adaptive technology helped them to catch up with other learners thus enabling them to learn close to the same pace as the others.

Regarding the tutors' effective use of adaptive technology devices when teaching, the VI student teachers pointed out that tutors did not use adaptive technology devices and thus their effectiveness could not be determined. They further explained that some tutors seemed not to be aware of adaptive technology devices and even ignored their existence in class during instruction. When the visually impaired student teachers were asked ways in which adaptive technology devices enhanced their understanding of subject content, they gave various answers. They said that they followed the lesson. They referred to the use of Braille clock in Math where understanding of time became easier. The visually impaired students perceived that adaptive technology devices gave a sense of direction during the lesson. Different concepts could easily be understood thus interpretation of information was possible. They gave the example of use of stress marks in English. Stress marks were useful in distinguishing the part of speech that a word belongs to and in bringing out correct pronunciation. With the use of tactile diagrams the VI student teachers could conceptualize where the primary stress mark should be placed in order to make a distinction between the functions and pronunciation of the pair of words. The VI student teachers agreed that adaptive technology devices made knowledge presented real thus information would be retained for long.

The VI student teachers perceived adaptive technology as a motivator when learning the subject content in several ways; it made them get in touch with what other student teachers were learning. For instance when learning rotation and revolution in Social Studies, a tactile globe would enable them to understand the concept of revolution and rotations thus perceive their effects on the earth like time and seasons. This would

motivate them to learn more on the topic. They also said that what was taught was simplified and clear which kept their curiosity high. The interview further revealed that visually impaired student teachers felt that tutors should use adaptive technology when teaching VI student teachers so as to make them understand, and conceptualize concepts in the subject content.

When tutors taught without using adaptive technology devices, visually impaired student teachers pointed out that it was boring, abstract and difficult to understand concepts. They also added that they felt not catered for and therefore left out of the lesson. They felt that this would result in lack of concentration and in their view concepts may not be learnt and objectives not achieved. The findings revealed the situation the visually impaired student teachers are in. As earlier noted, most of the tutors do not use adaptive technology during instruction and thus the VI student teachers are not catered for; integration of adaptive technology is thus low. Kilel (2012) asserts that various practical skills need to be reinforced using the teaching and learning aids There is need to adapt instructional resources to cater for learners with diverse needs (Agumba et al, 2009). Lack of integration of adaptive technology may make the visually impaired students feel disadvantaged thus affecting their attitudes towards the teaching career. The attitude of the disabled can be more handicapping than the handicap itself. (Ndurumo, 1993).

When asked about challenges faced with regard to the use of adaptive technology devices, the visually impaired student teachers revealed that some facilities were available but were not used. Closed circuit television was available in one of the colleges but never used. Tactile maps were used during exams only. They added that over time the notes they had written in Braille became bulky and could not be carried around yet they lacked space or a room to store items and work from. Some facilities were not available

and therefore not in use in their primary TTCs, this included the braille clock, talking tablets, highlighters and telescopes. Brailed textbooks were scarce with only bibles and novels available. The available old recorded tapes were not clear. This is in line with Republic of Kenya (1999) who state that the VI students relied on audio-taped books which were of poor quality. The VI student teachers also revealed that computers were available in their primary TTCs but they lacked programmes for computers like jaws for the visually impaired. During instruction, the VI student teachers said that tutors did not use adaptive technology devices thus following the lesson was a big challenge.

Regarding what the college administration could do to improve on integration of adaptive technology, the visually impaired student teachers suggested that administration should avail the required adaptive technology devices like Braille machines. Brailed course books for English and Kiswahili subjects should also be availed in the library so that they can read them on their own and understand. This is in line with what Korir (2015) found out in a study on integration program in Kenya, visually impaired students said that they were treated like abnormal students in the school. Their basic needs were not being addressed. Given the right learning environment, the visually impaired students would attain social and survival skills in regular school environment. This would serve as evidence that the disabled can be mainstreamed in to the society. If all the necessary measures are taken into consideration to minimize some of the challenges facing visually impaired students, then the influence of an integrated education program on performance of students with visual impairment would be positive.

The VI students also recommended that computer software for the VI students should be availed so that they can easily search for information and easily understand the different concepts taught. Recorded materials should be availed and saved in flash disks so that the

student teachers from anywhere easily access them. The VI student teachers also felt that tutors should be trained on the use of adaptive technology and English Braille. This would enable them to prepare tactile diagrams and use them during instruction. They suggested that a professional proficient in the area of specific technology should also be availed to assist the tutors. They requested for a study room to be used by visually impaired student teachers for studying and keeping their learning resources like brailed notes which were bulky and could not fit into their desks. Katz and Mirenda (2002), opine that increased opportunities for students with disabilities to interact with and learn from peers without disabilities has been shown to correlate with measures of self-esteem, social skills, positive emotional and behavioral outcomes. It has also influenced academic achievement for students with developmental disabilities. Schools also benefit when they have students with disabilities in general education settings, since funds allocated for special education classes can now be put elsewhere to fund inclusive schooling. When students are fully included in the general education setting, the money that was used for those segregated services may be used elsewhere.

## 4.6 College Administration Support on Integration of Adaptive Technology for VI Student Teachers in the Primary TTC's

The college administrators are the key individuals in inclusive education and thus should have knowledge regarding adaptive technology for visually impaired VI student teachers. It is observed that administrative support (or lack thereof) can make or break teachers' undertakings to integrate technology into the classroom. With minimal support, even the most talented teachers will have little success in technology integration (Becker & Ravitz, 1999; Zhao et al., 2002). The entire process of introducing technology in any organization including educational institutions requires leadership (Mertz and Mertz, 2003). The study therefore sought to find out from the respondents their opinions about

college administration's support in the integration of adaptive technology for VI student

teachers in primary TTC and their responses were summarized in Table 4.12.

Table 4.12: *Tutors responses on college administration support on integration of adaptive technology for VI student teachers in the primary TTCs*

| Statement | SA | | A | | UN | | D | | SD | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | % | F | % | F | % | F | % | F | % | F | % |
| The college administration provides adequate ATD for VIS teachers | 9 | 9.7 | 22 | 23.7 | 14 | 15.1 | 38 | 40.9 | 10 | 10.8 | 93 | 100 |
| The college administration provides workshops and training for tutors on integration of adaptive technology | 7 | 7.5 | 14 | 15.1 | 13 | 14.0 | 37 | 39.8 | 22 | 23.7 | 93 | 100 |
| The college administration offers technical support and maintenance of adaptive technology devices | 12 | 12.9 | 33 | 35.5 | 18 | 19.4 | 22 | 23.7 | 8 | 8.6 | 93 | 100 |
| The college administration provides a braillist to assist tutors on ATD use | 39 | 41.9 | 42 | 45.2 | 2 | 2.2 | 8 | 8.6 | 2 | 2.2 | 93 | 100 |

| The college administration recognizes that integration of adaptive technology is important for VIS teachers | 32 | 34.4 | 41 | 44.1 | 8 | 8.6 | 10 | 10.8 | 2 | 2.2 | 93 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| The college administration does not motivate tutors to use ATD | 14 | 15.1 | 30 | 32.3 | 20 | 21.5 | 12 | 12.9 | 17 | 18.3 | 93 | 100 |
| The college administration is not keen on the use of ATD | 13 | 14.0 | 27 | 29.0 | 14 | 15.1 | 24 | 25.8 | 15 | 16.1 | 93 | 100 |

It is evident in Table 4.12 that 40.9% (38), 23.7% (22) and (10.8%) of the tutors disagreed, agreed and strongly disagreed respectively that the college administration provides adequate ATD for VI student teachers while the remaining 9.7% (9) strongly agreed. Further, on whether the college administration provides workshops and training for tutors on integration of adaptive technology, 39.8% (37) disagreed, 23.7% (22) strongly disagreed while 15.1% (14), 14.0% (13) and 7.5% (7) agreed, were undecided and strongly agreed respectively. It is also clear from the table that, 33.5% (33), 23.7% (22) and 19.4% (18) of the respondents agreed, disagreed and was undecided respectively on whether the college administration offers technical support and maintenance of adaptive technology devices. Another 12.9% (12) and 8.6% (8) strongly agreed and strongly disagreed respectively. On whether the college administration provides a brallist to assist tutors on ATD use, 45.2% (42) and 41.9% (39) agreed and strongly agreed respectively while 8.6%(98) disagreed. An equal proportion of 2.2% (8) strongly disagreed and was undecided respectively.

Results also showed that majority 44.1% (41) and 34.4% (32) agreed and strongly agreed respectively that the college administration recognizes that integration of adaptive technology is important for VI student teachers while 10.8% (10) disagreed. Another

8.6% (8) and 2.2% (2) were undecided and strongly disagreed respectively. It is also clear that 32.3% (30) of the respondents agreed that the college administration does not motivate the tutors to use adaptive technology, 21.5% (20) were undecided while 18.3% (17) strongly disagreed. Further, 15.1% (14) strongly agreed. The table reveals that 29.0% (27) of the respondents agreed that the college administration is not keen on the use of adaptive technology in instruction, 25.8% (24) disagreed while 16.1% (15) strongly disagreed. The remaining 15.1% (14) and 14.0% (13) were undecided and strongly agreed respectively. The findings implied that the college administration did not fully support integration of adaptive technology devices. The head of the institution should provide the necessary teaching materials and promote staff welfare (Agumba et al, 2009).

In the interviews with the heads of departments and deans of curriculum with regard to college administration support in the integration of adaptive technology for VI student teachers in primary TTCs, it was revealed that the administration did not provide adequate adaptive technology devices. They also pointed out that the college rarely provided workshops and training on integration of adaptive technology to tutors. When the heads of departments and deans of curriculum were asked on how the college administration offered technical support and maintenance of adaptive technology devices, they said that serviced and maintained Braille machines. A braillist had been employed in each of the colleges and a technician would be called occasionally. The braillist assisted tutors and VI student teachers on integration of adaptive technology. This concurs with a study on integration of the disabled by Korir (2015) who found that there was little commitment from the Kenya government through the ministry of education to support the program. The students with visual impairment lacked Braille papers and the school administration did not handle them as part of the school; instead, they relied on the Kenya

Society for the Blind to coordinate the program. The administration did not have the guidelines / policy on the implementation of the program. Few teachers had once been taken for an in-service course on special education while the rest had never been trained at all.

Trainings offered by colleges were sponsored by NGOs thus the training was rare and irregular. With regard to challenges facing tutors in integration of adaptive technology in their instruction, the Deans of Curriculum and heads of department mentioned that they lacked knowledge and skills on integration. This, they said was due to lack of training on integration of adaptive technology. Lack of proficiency in English Braille made the tutor be limited in checking if the VI students had written the correct things in Braille and relying on the brailist who could easily mislead them. They were also not able to prepare tactile diagrams since labelling would be in Braille.

The adaptive technology devices like brailled textbooks for reference were inadequate. This hampered integration of adaptive technology which is in line with the theoretical framework which guided this study. Rogers (2003), in his theory of innovation asserts that the nature of the social system and extent of change agents affect adoption of innovation. The social and communication structure of a system can facilitate or impede the diffusion of innovations in the system. The college administration being the social system in this context needed to provide adaptive technology devices, train tutors on integration of adaptive technology for VI student teachers for the innovation which was integration of adaptive technology to be infused at the primary TTCs. Money can be spent on staffing to support the general education teacher as well as materials for adaptation of curriculum (McCarty, 2006).

The Deans of Curriculum and heads of department made the following recommendations to the college administration in order to improve integration of adaptive technology for VI student teachers in instruction. First, arrangements should be made to avail adaptive technology devices, this could be provided by relevant stakeholders, the ministry and the county. Tuimur (2011) asserts that instructional materials should be made available to teachers. Secondly, the Deans of Curriculum and heads of department recommended that the college administration should organize training of tutors on how to use adaptive technology devices. This would ensure that the tutors were knowledgeable and had confidence when using adaptive technology. Regular capacity building of tutors would update knowledge on a regular basis so as to keep pace with the new trends in the profession (Agumba et al, 2009).

Increase of the number of brailists assisting the VI student teachers was the Deans of Curriculum and heads of departments' third recommendation. One brailist was overloaded since use of adaptive technology was applicable in all the classes with visually impaired student teachers. Teaching facilities, financial resources, quality of teaching and learning resources have influence on technical teacher training (Guto,2010). Therefore adaptive technology devices should be provided by the college administration for the visually impaired student teachers.

In her study on integration program in Kenya, Korir (2015) gathered from the school administrators that the purchasing of teaching and learning materials were expensive and the government did not assist financially. This made the visually impaired students miss relevant lessons as they waited for the materials to be bought and sometimes it took more than a month before it was received. Teachers were not inducted on their entry to school and noted that much of the visually impaired students' time was wasted since the teachers

were not available for them during the time for extra coaching. Because of this, most of the visually impaired students had reservations amongst themselves.

The heads of departments and deans of curriculum also recommended that specific classes for VI student teachers should be established in college. This would ensure that they were given special attention. Labs and a library for VI student teachers could also be established which ensured that adaptive technology was provided, serviced and well-kept for the visually impaired student teachers. McMaster (2013) explains that successful inclusion is a culmination of the entire school embracing the inclusion model. The culture of a school, which expresses compassionate, understanding of differences in students, and perceived as a resource is important. The staff should ensure that the students' needs are identified and intervention and support services given.

## 4.7 Chapter Summary

The chapter has presented the findings of the study based on data collected from the respondents. Analysis of data and discussion of findings was done being guided by the five research questions which were:

i) What types of adaptive technology devices for VI student teachers were available and used for integration in instruction in primary TTCs?

ii) What was the state of tutor training on the integration of adaptive technology for VI student teachers in instruction in primary TTCs?

iii) What were the tutors' attitudes towards integration of adaptive technology for VI student teachers in instruction in primary TTCs?

iv) What were the VI student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs?

v) What support was provided by the college administration in the integration of adaptive technology for VI student teachers in instruction in primary TTCs?

## CHAPTER FIVE

## SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

### 5 Introduction

In this Chapter, a summary of findings is presented based on the discussion of findings made in Chapter Four. As a result of this, conclusions and recommendations regarding the integration of adaptive technology in instruction of visually impaired student teachers have been made. Suggestions for future research indicated.

**5.1 Summary of Findings**

This section gives a summary of findings reported in chapter four. The findings are presented as follows.

**5.1.1 Availability and Use of Adaptive Technology Devices for VI Student Teachers for Integration in Primary TTC.**

The study sought to find out from the respondents whether the adaptive technology devices were available and in use in their primary TTCs. Adaptive technology devices for VI student teachers for integration in primary TTCs were available and inadequate. The few that were available were not sufficiently utilized. Braille machines and large print texts, were available to majority of them 90.3% (84) and 75.3% (70) respectively. This maybe explained by the fact that totally blind student teachers needed to use Braille machines during the lesson thus they had to be availed. The primary tactile medium used by VI student teachers is the Braille code developed by Louis Braille in 1829 (Berdin and Blackhurst, 1985). It was realized that over 50% (48) of the respondents indicated that tactile diagrams, tactile maps, brailled textbooks, screen readers, tape recorded texts, real objects and magnifiers were available. The Braille clock, talking tablets highlighters, telescopes, slates and stylus were not available to majority of them over 80%. Furthermore, all 100% (93) of the respondents asserted that braille note takers, computer screen magnification, description video services and optical character recognition were not available. This meant that tutors in primary TTCs had not integrated ICT in when teaching the visually impaired. Computers are of great significance in the teaching and learning of visually impaired student teachers. They can be used to store, retrieve, manipulate, transmit and receive information electronically in digital form.(Agumba et al, 2009).Visually impaired student teachers may have missed out on this since computer applications were not available in the primary TTCs studied. All the respondents noted that CCTVs were available and not in use. This was also noted by the visually impaired student teachers during the focus group interview. This may be as a result of the tutor's lack of expertise in using CCTVs.

**5.1.2 Tutor Training on the Integration of Adaptive Technology for VI Student Teachers in Primary TTC's**

The study revealed that 66.7% (62) had not received training in Training in Special Needs Education at the university while 33.3% (31) had ; this shows that some of them do not have any knowledge on how to deal with the VI student teachers students. It is evident that most tutors had received it in universities however; some of them had interests in it and had opted to acquire it privately.

That majority (76.3%) of the tutors rated their proficiency in English Braille as poor. The primary tactile medium used by VI student teachers is the Braille code developed by Louis Braille in 1829.Those teaching learners using Braille should be well trained (Berdin and Blackhurst, 1985). According to the Kenya Constitution, any person with disability is entitled to use Braille (RoK, 2010).Tutors should be proficient in Braille so as to easily communicate with visually impaired student teachers using different media.

The findings also revealed that, majority 86.6% (75) of the respondents had never had any training on preparation of tactile maps and diagrams. This implies that since a large proportion had not been trained on the preparation of tactile maps and diagrams integration of adaptive technology was hampered. An adapted syllabus for VI student teachers has been prepared to cater for their needs. The syllabus stresses that the teaching of student teachers who are visually impaired demands that tutors use appropriate resources and be competent in development and production of quality tactile diagrams and maps (KIE, 2005).

With regard to expertise in the integration of adaptive technology for VI student teachers during instruction, majority of the respondents stated that their proficiency in the use of

tactile diagrams, tactile maps, tactile globes and screen readers respectively as poor. Similarly their ability to use Tape recorded texts, brailled text books, talking tablets and real objects was poor. These findings concur with what MOEST (2005) asserts that, the problem in special education has been inadequate capacity among many teachers to handle children with special needs. Special educators and related professional personnel need to be aware of and know how to use various technologies if they are to be maximally effective in helping exceptional children. They must be able to modify their instructional approaches to accommodate the special needs of students. They need to know how to use special assistive and adaptive equipments (Berdin and Blackhurst,1985) and Agumba et al, 2009) state that it is vital for a teacher to be familiar with the wide range of resources for use because what is finally adopted depends on the teachers' competency. Jones (2017) asserts that, lack of teacher training is a barrier for students because of inadequate skills. These teachers are not aware of how to properly accommodate and modify the assignments in classroom so that the students have access to curriculum and environment. This has an effect on how much the teacher can provide support in the classroom. The lack of support provided by teachers seemed to have a lasting effect on students.

## 5.1.3 Tutors' Attitudes towards Integration of Adaptive Technology for VI student Teachers in Primary TTC's

The findings revealed that 68.8% (64) of the respondents strongly agreed that they felt that adaptive technology was valuable when teaching VI student teachers. Further, (60.2%), (58.1%) and (78.5%) of the respondents strongly agreed that they felt that adaptive technology enhanced VI student teacher's understanding of the subject content, found adaptive technology a motivator of VI student teachers in learning the subject matter and that they recommended that tutors should be trained on the integration of

adaptive technology for VI student teachers respectively. On whether they found teaching student teachers using ATD too demanding, 28.0% (26) agreed. They were also asked whether they felt uncomfortable teaching VI students using ADT, 21.5% (20) agreed while, 10.8% (10) strongly agreed. Further, 25.8% (24) agreed and 15.1% (14) strongly agreed that they were confident using ADT in teaching VI student teachers. It was also realized that (39.8%) and 36.6% (34) of the respondents agreed and strongly agreed that they thought special education teachers were better placed to use ATD. When asked whether they recommended that teaching VI student teachers using ATD should be optional, 12.0% (11) and 4.3% (4) agreed and strongly agreed respectively. They saw the need for use of adaptive technology for visually impaired student teachers but where not confident due to their incompetence. This implies that the tutors had positive attitudes towards integration of adaptive technology for visually impaired during instruction. They appreciated the role of adaptive technology devices in enhancing understanding of the subject content. The teachers' attitude towards a teaching strategy affects his efficiency in teaching (wanjala, 2005).Greater integration of the visually impaired into classes with seeing children and more training about the capabilities of the visually impaired for regular classroom teachers would result in improved  attitudes towards the visually impaired  and more  appropriate educational planning and placement (Berdin and Blackhurst,1985:257). Chemwei (2013) stresses that; a positive attitude towards innovation generally leads to adoption.

## 5.1.4 The VI student teachers' perceptions on the integration of adaptive technology in instruction in primary TTCs

The VI student teachers felt that adaptive technology devices were inadequate. With regard to tactile diagrams and maps and slate and stylus, majority of VI student teachers said that they were available and in use in primary TTCs. Commenting on Braille

machines, all VI student teachers agreed that they were available and in use while the Braille clock, talking tablets, highlighters and telescopes were not available and therefore not in use. Large print texts, Braille textbooks, screen readers, recorded texts and magnifiers were available and in use to a small extent. Telescopes, Braille note takers, closed circular television, computer screen magnification, description video services and optical character recognition were not available and therefore not in use by all the visually impaired student teachers.

Majority of the visually impaired student teachers rated their proficiency in English Braille as very good and others as excellent. This implied that they could comfortably use adaptive technology, Berdin and Blackhurst,(1985) asserts that the primary tactile medium used by VI student teachers is the Braille code developed by Louis Braille in 1829 thus Braille was their tactile medium.

The VI student teachers perceived adaptive technology as valuable when teaching VI student teachers, because it enhanced understanding since learning became easy. It enabled them to catch up with other learners. Brailled notes could be saved and used later thus reducing costs. Regarding the tutors' effective use of adaptive technology devices when teaching, the VI student teachers pointed out that tutors did not use adaptive technology devices and thus were not effective. When the visually impaired student teachers were asked on ways in which adaptive technology devices enhanced their understanding of subject content, they said that they followed the lesson and that there was a sense of direction. Knowledge presented was real, interpretable and different concepts could easily be understood.

They further added that adaptive technology motivated them in learning the subject content in several ways which included; being in touch with what other student teachers

were learning, what was taught was simplified and clear and thus curiosity was high. The interview further revealed that visually impaired student teachers felt that tutors should use adaptive technology when teaching VI student teachers so as to make them understand, and conceptualize concepts in the subject content. When tutors taught without using adaptive technology devices, visually impaired student teachers' perception was that the lesson was boring; concepts were abstract and difficult to understand. They also added that they felt not catered for and therefore left out of the lesson. This would result in lack of concentration and in their view concepts may not be learnt and objectives not achieved. When asked about challenges faced with regard to the use of adaptive technology devices, the visually impaired student teachers revealed that some facilities were not available while others were available but were not used. Some ATDs were bulky and could not be carried around. Brailed textbooks were scarce where only bibles and novels were available while the available old recorded tapes were not clear. There was lack of space or a room to work from, programmes for computers for example jaws were few and tutors lacked skills to use ATDs.

Regarding the VI student teachers' perception on the college administration and improvement of integration of adaptive technology, the visually impaired student teachers felt that the college administration could avail the required adaptive technology devices like Braille machines. They further added that more Brailled course books and ICT software for the VI learners should be availed in the library. Tutors should be trained on the use of adaptive technology and English Braille and professionals in other areas of technology provided. Recorded materials should be saved in flash disks and a study room should be availed to be used by visually impaired student teachers.

**5.1.5 College Administration Support on Integration of Adaptive Technology for VI Student Teachers in the Primary TTC's**

The study findings revealed that 40.9% (38), of the respondents disagreed that the college administration provided adequate ATD for VI student teachers. The tutors strongly disagreed that the college administration provided workshops and training for tutors on integration of adaptive technology. It is also clear that, 35.5% (33) and 12.9% (12) respondents agreed and strongly agreed that the college administration offered technical support and maintenance of adaptive technology devices. On whether the college administration provided a braillist to assist tutors on ATD use, all the tutors agreed.

Results also showed that majority (44.1%) and 34.4% (32) agreed and strongly agreed respectively that the college administration recognized that integration of adaptive technology was important for VI student teachers. It is also clear that 32.3% (30) of the respondents agreed that the college administration did not motivate the tutors to use adaptive technology. The study further revealed that 29.0% (27) and 14.0% (13) of the respondents agreed that the college administration was not keen on the use of adaptive technology in instruction. In the interview with the heads of departments and deans of curriculum with regard to college administration support in the integration of adaptive technology for VI student teachers in primary TTCs, it was revealed that the administration did not provide adequate adaptive technology devices. They also pointed out that the college rarely provided workshops and training on integration of adaptive technology to tutors. When asked on how the college administration offered technical support and maintenance of adaptive technology devices, they said that there was servicing and maintenance of Braille machines.

They further revealed that the college administration provided a braillist to assist tutors and VI student teachers on integration of adaptive technology. With regard to challenges facing tutors in integration of adaptive technology in their instruction, the administrators said that they lacked knowledge and skills on integration of adaptive technology. The brailled textbooks for reference were scarce. Lack of expertise made the tutors  limited in assessing the VI students' work while relying on the brailist who could make wrong transcriptions.

The administrators recommended the following to the college administration in order to improve integration of adaptive technology for VI student teachers in instruction; Arrangements to avail adaptive technology should be made and tutors should be trained on how to use adaptive technology. Teaching facilities, financial resources, quality of teaching and learning resources have influence on technical teacher training (Guto, 2010). It is observed that administrative support (or lack thereof) can make or break teachers' undertakings to integrate technology into the classroom. With minimal support, even the most talented teachers will have little success in technology integration (Becker & Ravitz, 1999; Zhao et al., 2002).

**5.2 Conclusions**

Based on the findings of this study, the following conclusions were made:

The adaptive technology devices for VI student teachers for integration in primary TTC were inadequate in the colleges where this study was conducted. The few that were available were also not adequately utilized.

Tutor training on the integration of adaptive technology for VI student teachers in primary TTC's was wanting since tutors' expertise in the integration of adaptive technology for VI student teachers during instruction was insufficient or totally lacking. The frequency of training was quite low.

The Tutors' attitude towards integration of adaptive technology for VI student teachers in primary TTC's was positive. They acknowledged the value of adaptive technology.

The VI student teachers' perception on integration of adaptive technology was that adaptive technology devices were inadequate, majority of the tutors were not able to use adaptive technology devices during instruction and the college administration did not support integration fully.

The college administration support on integration of adaptive technology for VI Student teachers in the primary TTC's was insufficient.

## 5.3 Recommendations

The following recommendations were made for this study:

1. The adaptive technology devices for VI student teachers for integration in primary TTC should be availed to all tutors and college administrators. For

example .Braille machines should be available in departmental offices in primary TTCs so that tutors can work independently in the preparation of teaching materials.

2. The MOEST should develop in-service courses to train the tutors on the use of Braille and preparation of tactile diagrams so as to effectively teach VI Student teachers in primary TTCs since it is charged with the responsibility.

3. The primary TTC tutors should be exposed to ways of integrating adaptive technology during instruction of visually impaired student teachers so as to confidently teach and have positive attitudes.

4. The visually impaired student teachers should be provided with brailled books on all the subjects taught in Primary TTCs. They should also have rooms where they can comfortably study and keep their adaptive technology devices.

5. The college administration of public primary TTCs should fully support the integration of adaptive technology for VI Student teachers in the primary TTCs by buying resources and training tutors on integration of adaptive technology.

## 5.4 Suggestions for Further Research

The following suggestions for further research were made:

1. An assessment of training needs of college administrators and tutors in adaptive technology for VI Student teachers in the primary TTC's.

2. A study on the challenges of the integration of adaptive technology for VI Student teachers in the primary TTC's.

3. A study on assessment of the integration of adaptive technology in primary schools.

4. A study on assessment of the integration of adaptive technology in secondary schools.

## REFERENCES

Adebisi, R.O. (2014). Using Information and Communications Technology (ICT) in teaching children with special needs in 21st century. *Journal of Research in Science, Technology & Mathematics Education (IJRSTME), 2 (1), 129 – 138.*

Abenga, E.S.B. (2005). *The adoption and use of new educational technologies in the training of teachers of English in Primary Teachers Colleges in Kenya.* (Unpublished D.Phil Thesis), Eldoret: Moi University.

Agbenyega, J.(2006).*Examining Teachers' concerns and attitudes to inclusive education in Ghana.* http:www.kenpro.org/papers/challenges/fa 7th June 2013.

Agumba, N.Kipsoi, E.Misigo, B. Simiyu, C.and Ongek, M. (2009). *Primary Teacher Education; Education.* Nairobi: Jomo Kenyatta Foundation.

Alliance for Technology Access. (2000). *Computer and web resources for people with disabilities: a guide to exploring today's assistive technology*, 3rd ed, Alameda, CA Hunter House  Publishers.

Anderson, C. Klassen, R. & Georgiou, G. (2007). What teachers say they need and what school psychologists can offer. *School Psychology International*, 28(2), 131-147.)

Ary, D. (1972).*An introduction to Educational Research.* New York, Rinehart and Winston.

Basham, J. D., & Marino, M. T. (2013). Understanding STEM education and supporting students  through universal design for learning. *Teaching Exceptional Children, 45(4), 8–15.*

Bausch, M., & Ault, M. (2008). Assistive Technology Implementation Plan. Teaching Exceptional Children, 41(1), 6–14.

Bhattacharya, D. (2002). Human resource planning.1st Edition.

Becker, H. & Ravitz, J. (1999). *The influence of computer and internet use on teachers' pedagogical practices and perceptions. Journal of Research on Computing in Education, 31*(4), 356-384.

Belcheir, M. J. & Cucek, M. (2002). *Faculty perceptions of teaching distance education Courses* Research Report 2002. (Boise State University Institutional Assessment Report 2002-02) http://www2.boisestate.edu/iassess/ Reports/RR %202002-02.htm September 9, 2002, from

Berdine, W. and Blackhurst.(1985).*An Introduction to Special Education*.2nd Ed. Boston: Scott, Foresman and company.

Bitter, G.G.and Legacy, J.M. (2009).Using technology in the classroom. (7th Ed.) Pearson International Edition: New York

Boudah, J. D.(2011).*Conducting Educational Research*. London: SAGE Publications.

Braslavsky, C. (2004) Quality Education and Learning Materials in the 21st Century Worlddidac –Basel   Switzerland

Brownell, M. T., & Leko, M. M. (2014). Preparing special educators to teach literacy.

Bulloch, K. (2018). *How to Adapt Your Teaching Strategies to Student Needs*. Retrieved on 20th July 2018 from; http://www.readingrockets.org/article/how-adapt-your-teaching- Strategies-student-needs

Chemwei, B.(2013).*Factors influencing teacher educators level of information communication technology integration in teaching in primary teacher training colleges in Kenya.* (Unpublished DPhil Thesis), Moi University, Kenya.

Cara, O. and Coulon, A.(2000). Impact of teachers' qualifications on learners. *National Research and Development Centre for adult literacy and numeracy* www.nrdc.org.uk/content.asp? 13/1/2015

Caracelli,V. and Greene, J.C.(1997).Crafting Mixed-Method Evaluation Designs. *New Directions for Evaluation.* Pages 19-32

Casimir, G. (2001). *Enhancing learning with assistive technology, In Integration and inclusion In  action* edited by P Foreman, pages 360- 388. Marrickville NSW: Harcourt.

Chireshe R. 2011. School Counsellors' and Students' Perceptions of the Benefits of School Guidance and Councelling Services in Zimbabwean Secondary Schools. *Journal of  Social Science.* 29(2): 101-108.

Chumo, S. (2009). *The effects of school resources on students academic performance in secondary schools;* A case of Nandi North District. (Unpublished Mphil Thesis). Moi University, Kenya.

Cohen, L., Manion, L. & Morrison, K. (2000) *Research Methods in Education* (5th edition). London, Routledge  Falmer.

Cohen,L. and Manion, C.(2003).*Research Methods in Education*. London: Croom Helm Ltd

Collier, C. (2001). *Staff development for technology integration in the classroom.* In J. Lebaron, & C. Collier (Eds.), *Technology in its place: Successful technology infusion in school* (pp. 61-72). San Francisco: Jossey-Bass.

Cook, A. M., & Polgar, J. M. (2014). Assistive technologies: Principles and practice. *Elsevie  Health Sciences.*

Cope, C. & Ward, P. (2002). *Integrating learning technology into classrooms: The importance of teachers' perceptions.* Educational Technology & Society 5(1) 67-74.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed method approaches.* Thousand Oaks, CA: Sage Publications.

Crowther D, Dyson A, Millward, A . (2001). Supporting Pupils with Special Educational Needs: Issues and Dilemmas for Special Needs Coordinators in English Primary Schools. *European Journal of Special Needs Education.* 16(2): 85-97.

Dakwa, F.E, (2011). A Reflection of Teacher's Perceptions on the Inclusion of Children with Visual Impairment in Ordinary Schools Francis Emison Dakwa Masvingo State University Zimbabwe *International Journal of  Open & Distance Learning Volume 1 Number (1) 2011*

Dalen, D.B. (1979).*Understanding Educational Research. An introduction. (4thEd.*).New York:  McGraw-Hill Book Company.

Dede, C. (1997). *Rethinking how to invest in technology*. *Educational Leadership, 55*(3), 12-16.

Dell, A. G., Newton, D. A., & Petroff, J. G. (2008). *Assistive Technology in the Classroom: Enhancing the School Experiences of Students with Disabilities.* New Jersey: Pearson Education, Inc.

Dell, A. G., Newton, D. A., & Petroff, J. G. (2012). Assistive technology in the classroom (2nd ed.). Boston, MA: Pearson Education, Inc.

Dickerson LR, Smith PB, Moore JE 1997. An Overview of Blindness and Visual Impairments. In J.E. Moore, W.H. Graves and J.B. Patterson (Eds), Foundations of Rehabilitation Counseling with Persons Who are Blind or Visually Impaired. New York: *American Foundation for the Blind, pp. 1 - 24.*

Disability Action Council (Cambodia) (2010). Children with special needs in the classroom *In-service Teacher Training Course* trainers' guide www.hiprowb.org/fileadmin/cdroms/E 5/13/2013

Dumont, H. (2017). How to deal with students' individual differences. Retrived on 20th July 2018, from https://bold.expert/how-to-deal-with-students-individual-differences.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovich College Publishers

Earle, R. (2002). The integration of instructional technology into public education: Promises and challenges. *ET Magazine, 42*(1), 5-13. http://www.bookstoread.com/etp/earle.pdf April 6th 2013,

Eredics, N. (2016). Accommodations and Modifications: A How-To Q&A with Nicole Eredics of the Inclusive Class. Retrieved on 25th July 2018 from http://blog.brookespublishing.com/accommodations-and-modifications-a-how-to-qa-with-nicole-eredics-of-the-inclusive-class/

Eyo MB, Joshua AM, Esuong AE 2010. Attitude of Secondary School Students Towards Guidance and Counselling Services in Cross River State. *Edo Journal of Counselling. 3(1): 87-99.*

Farrant, J.S. (2009).*Principles and Practice of Education*. (New Edition)Harlow: Longman Group UK.

Flippo, K. F. (1995). *Assistive technology: a resource for school, work, and Community,* Baltimore: P.H. Brookes Pub. Co.

Floyd, K. K., Smith C., Lora, L., Jeffs, T., & Judge, S. A. (2008). Assistive technology and emergent literacy for pre-schoolers: A literature review. Assistive Technology Outcomes and Benefits, 5(1), 92-102.

Fraenkel, J.R. and Wallen, N.E.(2003).*How to Design and Evaluate Research in Education. (5th Ed.)*New York: McGraw-Hill Higher Education.

Gilakjani, A. P., Leong, L.-M., & Ismail, H. N. (2013). Teachers' use of technology and constructivism. *International Journal of Modern Education and Computer Science, 5(4),49–63. doi:10.5815/ijmecs.*

Government of Kenya (1964). *Kenya Education Commission Report.* Part1.Nairobi: Government Printers.

Government of Kenya (1988). *Report of the Presidential working Party on Education and Manpower Training for the next Decade and beyond.* Nairobi: Government Printers.

Groff, J. and Mouza, C. (2008). A framework for addressing challenges to classroom technology use. *AACE Journal, 16*(1), 21-46.

Gronseth, S. (2011). *Factors that impact the use of assistive technologies to support secondary students with mild disabilities (Doctoral dissertation).* Retrieved from ProQuest Dissertations & Theses Full Text. (3456464.)

Groves, M., Jernigan, M., & Eller, K. (1997). But how do we use it?: Discovering hidden barriers and unanticipated successes in integrating computers in a preschool curriculum. *Proceedings of the Families, Technology and Education Conference* (pp. 57-62), Chicago, IL. (ERIC Document Reproduction Service No.ED424998)

Guto,M.D.(2010).*Effects of learning resources management on training technical teachers at Kenya Technical Teachers College*. (Unpublished Mphil Thesis), Eldoret:Moi University, Kenya.

Haney, J.and Lumpe, A. (1995). A teacher professional development inventory guided by reform policies, teachers' needs, and research. *Journal of Science Teacher Education*, *6*(4), 187-196.

Hasselbring, T. and Glaser, C. (2000). *The future of children and Computer Technology vol. 10 • no. 2 – http://www.futureofchildren.org*

Hills, P.C. (1982*). A dictionary of education.* London; Routledge and Kegan Paul.

Jayaratne, N. (1993). *Understanding management research: An introduction to epistemology.*London: Sage Publishers.

Jenson, J., Taylor, N., & Fisher, S. (2010). *Critical Review and Analysis of the Issue of Skills, Technology and Learning.* Toronto: York University.

Johnson, D. W. (1970). *Social psychology of education*. Edina, MN: Interaction Book Company.

Johnson, D. W.and Johnson, R. T. (1995). *Teaching students to be peacemakers* (3rd Ed.). Edina, MN: Interaction Book Company.

Jonassen, D. H.and Reeves, T. (1996).*Learning with computers*; *Computers as cognitive tools*. In D. H. Jonassen (Ed.) Handbook of research for Educational Communication and Technology. New York: Macmillan.

Jones, K. J, (2017).Educating Students with Visual Impairments in the General Education Setting. Retrieved from http://aquila.usm.edu/dissertations/1337 on 21st July 2018

Judson. (2006).How teachers integrate technology and their beliefs about learning: Is there a connection? *Journal of Technology and Teacher Education.*14, 581-597.

Kabue, S.N. (1984).*A study of the educational integration of the visually handicapped children at the primary school level.* Unpublished Thesis, University of Nairobi, Kenya.

Kafu, P.A. (2003). *Teacher Education: Its implications to quality of Teachers in Kenya* (Unpublished paper). Eldoret: Moi University, Kenya.

Kafu,P.A.(2011).Teacher Education in Kenya; Emerging issues. *International journal of curriculum and instruction,* 1, 43-52 http://www.muk.ac.ke/ijci/

Kennedy, M. J., & Deshler, D. D. (2010). *Literacy instruction, technology, and students with learning disabilities:* Research we have, research we need. Learning Disability Quarterly, 33, 289-242.

Kerlinger, F. (1983). *Foundations of behavioral Research*. New Delhi: Surget Publications

KIE (2002). *Primary Education Syllabus*, Volume Two. Ministry of Education Science and Technology.

KIE (2005).*Social Studies Adapted syllabus for Primary Teacher Education*. Ministry of Education.

Kilel,J.K.(2012).*Factors influencing quality training in public primary teachers training colleges in Rift Valley Zone, Kenya (.*Unpublished M.Ed. Thesis). Moi University, Kenya.

Kimani,S.M.(2011).*An assessment of mathematics teachers' in service training needs in lower division of Kandara*. (Unpublished M.Ed. Thesis), Moi University, Elllldoret: Kenya.

Kinder, S.J. (1973). *Using instructional media*. USA: Litton Educational Publishing Inc.

Kinyanjui,P E. The Organization of Teacher Training at a Distance with Particular reference to Kenya. *Distance Education in Anglophone Africa: Experience with secondary Education and Teacher Training.* Washington, D.C: World Bank,117-22

Kiriathe, E.N. (2011) *The implementation of persons with disabilities act (2003) in public universities in Kenya: Its implications on social interaction and learning of students with disabilities.* (Unpublished, D.Phil Thesis).Moi University: Eldoret Kenya.

Koch, K. (2017). Stay in the box! Embedded Assistive Technology Improves access for students with disabilities. Education sciences, 2017, 82, doi: 10.3390/educsci7040082

Kochhar, S.K. (1991). *The teaching of Social Studies*. New Delhi: Sterling Publishers Private Ltd...

Koech,J.(2011)*Availability and utilization of instructional resources for the teaching of science in primary schools case of Kosirai Division, Nandi North District.* (Unpublished Thesis, M.Phil Thesis).Moi University: Eldoret, Kenya.

Korir,B, C. (2015).The Perception of Students and Teachers on the Integration Programme of Students with Visual Impairment in Secondary Schools: A Case of Ainamoi Sub-County, Kericho County, Kenya. *Journal of Education and Practice.*

Kothari, C.R. (1987) *Research Methodology, Methods and Techniques*. (3rd edition) New Delhi, Wiley Eastern Ltd.

Lazzaro, Joseph J.(2001) *Adaptive technologies for learning & work environments*, 2nd ed, Chicago : American Library Association. *Learning Strategies, Supports, and Interventions.* Retrieved on 5/12/2013 from www.edu.gov.mb.ca./../4.pdf

Levine, T., & Donista-Schmidt, S. (1998). *Computer use, confidence, attitudes, and knowledge*: A causal analysis. *Computers in Human Behavior*, *14*(1), 125-146.

Loughran, J. (2006).*Developing pedagogy of teacher Education; Understanding Teaching and Learning about Teaching.* New york: Routledge.

Longman (2005).*Longman Dictionary of Contemporary English*. Harlow, Pearson Education Limited.

Maguvhe, M, O. (2014). Perceptions of South African Teachers and Students in Residential Secondary Schools for the Blind on Inclusive Education.   ISSN 2039-2117 (online) ISSN 2039-9340 *Mediterranean Journal of Social Sciences*

Maheshwari V.K, and Maheshwari, S.R.(2014), *Individual difference among children in school*. Retrieved 25th July 2018 from www.vkmaheshwari.com

Maida, A. (2015), *Special Education Teachers' Perceptions and Practices of Technology Integration for Supporting Students with Multiple Exceptionalities.* Master of teaching Thesis, University of Toronto

Male, Mary. (2003)*Technology For Inclusion,* 4th ed, Boston. Allyn and Bacon,

Malakwen,B.(2000)*Teacher Trainers and Trainees' attitudes towards the implementation of Social Studies curriculum in Kenya's Teachers' colleges*; The case of Tambach (Unpublished. M.Phil. Thesis), Eldoret: Moi University.

Martin, E. W., Martin, R., & Terman, D. L. (1996). The legislative and litigation history of special education.

Mataruse, K. (2002) Gender race and social class on dyscalculia. *African Journal of Special  Needs Education* 7 (1) 1-12.

Mazgon,J and  Stefanc, D (2012) Importance of the various characteristics of educational materials: different opinions, different perspectives *TOJET: The Turkish Online Journal of Educational Technology – July 2012*, volume 11 Issue 3

Menjo,D.K(2012)*Evaluation of the effectiveness of implementation of information communications technology(ICT)in primary teacher training colleges in Kenya.* (Unpublished D.Phil Thesis). Moi University: Eldoret, Kenya.

Mertens,D. (2005). *Research and Evaluation in Education and Psychology.* London: SAGE Publications.

Mertz,E.and Mertz,K.(2003). Managing technology integration in schools: A South African perspective. *Journal of Educational Administration.*41(2):186-200

Ministry of Education Science and Technology (2001). *Teaching and Learning in* the *Primary classroom.*

MOEST, (2001).Primary Teacher Education Syllabus, Vol. 2.KIE

Ministry of Education, (2009) *National Primary Teacher Trainers Induction Course: College level training of tutors; May 22$^{nd}$ to 5$^{th}$ June 2009*.Nairobi: Government Printers.

Ministry of Education, (2005) *Kenya Education Sector Support Programme 2005-2010.* Nairobi: Government Printers.

Moody, A. K. (2015). Procedures, considerations, and recommendations for the development of  assistive technology demonstration and lending sites. *Journal of Special Education Technology,* 30(3), 179-187. doi: 10.1177/0162643415619248

Morris, M. (2002, August). *How new teachers use technology in the classroom*. Paper presented at the Annual Summer Conference of the Association of Teacher Educators, Williamsburg, VA.

Muchilwa, R. (1998) *Availability and use of instructional materials for teaching History. A study of Secondary Schools in Mombasa District.* (Unpublished, M.  Phil. Thesis). Moi University.

Mugenda, O and Mugenda, A. (1999) *Research Methods: Quantitative and Qualitative Approaches.* Nairobi: Acts Press.

Mugo,B.C.(2008)*Adaptive/Assistive Technology for learners with visual impairment*. Proceedings from a workshop on Adaptation of Maps, Diagrams & Pictures (Graphics) for the Visualy Impaired at the Kenya Institute for the Blind: Nairobi.

Mugo, B.c. (2013). *Assistive technology and access to quality instruction for blind and visually impaired students: A comparative study of Kenyatta University Kenya and Syracuse University USA.* The Kenyatta University: unpublished PHD thesis

Mutai, N. (2010) Perception of secondary students on socio-cultural, economic and school-based factors influencing the rate of girls' school drop out: A case of Keiyo District. (Unpublished M, Phil Thesis). Moi University, Kenya

Mwaka, M**.**, Nabwire, V. K. & Musamas, J. (Eds.) (2014**)**. *Essentials of Instruction: A handbook for Teachers*. Eldoret: Moi University Press

Mwaura,S & Wanyera S,(2008) Introduction to Children with Special Needs. Nairobi: Kenya Institute of Special Education(KISE).

Myers, A. & Hansen, C. (2002). *Experimental Psychology*. Pacific Grove, CA: Wadsworth

Nachmins, F.and Nachmins, D (1992). *Research Methods in Social Sciences*. London: Edward Arnold.

Nafukho, F.M. and Kange the, S.(2002)*Training of trainers: Strategies for the 21st Century.* Nairobi: Moi University Press

Ndinda, M. H. (2005). *Integrating physically disabled children into regular schools in Kenya:* A case of Machakos District. Ph.D. Dissertation, University of Osnabruck, Germany.

Ndungu, C. W. (2013)pedagogical strategies for English language literacy in deaf schools: A study of selected deaf primary schools in central region of Kenya. (Unpublished D.Phil Thesis). Moi University, Eldoret, Kenya

Ndurumo, M. M.(1993). *Exceptional children: Development consequences and intervention.* Nairobi: Longman Publishers

Newman,W.L.(2011). *Social Research Methods.6th Edition. Qualitative and Quantitative approaches.* Boston: Pearson Education Inc.

Ngigi N.J.(2007) The constraints to advancement of gifted and talented students in Kenyan Secondary Schools: A case of Nairobi Province, M.Phil, Moi University

Ogoma,M.(1987)*A survey of Resources for Teaching Social Studies in Nairobi Primary Schools,* Unpublished, M.Ed. P.T.E. Thesis, Kenyatta University.

O'Malley, J., & McCraw, H. (1999, Winter). *Students' perceptions of distance learning, online learning, and the traditional classroom*. Online Journal of Distance Learning Administration, 2(4). Retrieved April 13, 2013, from www.westga.edu/~distance/ omalley24.html

O'Malley, P., Jenkins, S., Wesley, B., Donehower, C., Rabuck, D., & Lewis, M. E. B. (2013, April). Effectiveness of using iPads to build math fluency. Paper presented at the *Council for Exceptional Children Annual Meeting,* San Antonio, Texas.

Orodho,A. J.(2009)*Elements of Education and Social Science Research Methods.* Nairobi: Kanezja Publishers

Owens, Janet (1999)*,Assistive technology issues for students with disabilities and university staff who work with them,* Herdsa annual international conference, Melbourne, 12-15 July, 1999 http://www.herdsa.org.au/branches/vic/Cornerstones/pdf/ Owens.PDF

Pearman, C. (2008). Independent reading of CD-ROM storybooks: *Measuring comprehension with oral retellings.*

Peralta, S. T. P., & Adriano, C. T. (in press). *Information and communication technology (ICT) integration in Teacher education institutions*.

Pijl SJ, Van Den Bos K 2001. Redesigning Regular Education Support in The Netherlands. European *Journal of Special Needs Education*. 16(2): 111-119.

Punch, F.K. (2011) *Introduction to Research Methods in Education*. London: SAGE publications.

Purcell,S. & Grant, D.(2004)*Assistive technology solutions for IEP teachers*, Book 2.Verona.WI:Attainment Co.

Rachel Janney & Martha Snell, (2013) *Modifying Schoolwork* Maryland United States Brookes publishers.

Rakes, G., & Casey, H. (2002). *An analysis of teacher concerns toward instructional* technology. International Journal of Educational Technology, 3(1). Retrieved April 11, 2013, from http://www.ed.uiuc.edu/ijet/v3n1/rakes/index.html

Republic of Kenya (1964) *Kenya Education Commission Report*. Nairobi: Government printers.

Republic of Kenya (1988) *Report of the Presidential working Party on Education and Manpower Training for the next Decade and Beyond*. Nairobi: Government Printers.

Republic of Kenya (2010). *The constitution of Kenya*. Nairobi: Government Printers.

Republic of Kenya (2009). *The National Special Needs Educational Policy Framework*. Nairobi: Government Printers.

Republic of Kenya (1999). *Totally Integrated Quality Education and Training. TIQET. Report of the commission's inquiry into the Education system of Kenya.* Nairobi: Government Printers.

Republic of Kenya, (2015). National policy for persons with disabilities. Nairobi: Government Printers

Republic of South Africa, 2005. G*uidelines for Inclusive Learning Programmes* Department of education. Retrieved on 5/12/201 from www.education.gov.za/linkclick.aspx

Rice,J.K.(2010).*The impact of teacher experience.* Retrieved on 14/1/2015 from www.urban.org/research

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.

Rogers, E. M. (2003). Diffusion of innovations. (5th ed.)New York, Free press.

Rukwaro, R.and Kimani, Paul (2007)*Open, Distance &Electronic Learning (ODEL)Special Needs Education, Module IE 022,*Nairobi:Kenya Institute of Special Education.

Samak, Z.A. (2006). *.An exploration of Jordanian English language teachers/attitudes, skills, and access as indicator of information and communication technology integration on Jordan*.(Unpublished doctoral dissertation).Florida State University.

Saunders, M, Lewis, P and Thornhill A.(2003)*Research Methods for Business students*. (3th Ed.) London: Pearson Education Limited.

Scardamalla, M. and Bereiter, C.(2003).Knowledge Building, In Encyclopaedia of Education (2nd ed,pp.1370-1373).New york : Macmillan Reference , USA

Scheeler, M., Congdon, M., & Stansbery, S. (2010). Providing immediate feedback to co-teachers through bug-in-ear technology. *Teacher Education and Special Education 33(1):83-96*

Schoepp, K. (2005). Barriers to technology integration in a technology-rich environment. Learning and teaching in in Higher Education: *Gulf Perspectives, 2(1), 1–24.*

Schroeder,F.(1989). *Literacy: The key to opportunity*. Baltimore: National Federation of the Blind.

Serem,J.D. (2008). *The attitude of home science school teachers and students towards clothing and Textiles unit in Uasin Gishu, Nandi and Keiyo Districts. Kenya. (*Unpublished M.phil Thesis). Moi University. Eldoret, Kenya

Sindelar, E. D. McCray, M. T. Brownell, & B. Lignugaris/Kraft (Eds.), *Handbook of Research on Special Education Teacher Preparation (pp. 255-270).* New York, NY: Routledge.

Sharmila. V, Nathan, W. Marita, F. Angela, S. Melissa. S, Reinie, C. and Torbjörn, F. (2015) *Factors Associated with Primary School Teachers' Attitudes Towards the Inclusion of Students with Disabilities.* Retrieved from. doi: 10.1371/journal.pone.0137002MCID: PMC4552744

Snowman, R and Biehler, R. (2000). *Psychology applied to teaching*.(9th Ed).Boston: Houghton Mifflin company.

Songe, E.O. (2004) Identification of curriculum barriers to successful inclusion of students with Visual impairments in Kenya Polytechnic. (Unpublished M.Ed Thesis). Kenyatta University. Nairobi, Kenya

Stratton. J.M. (1990), retrieved on 20th July 2018 from https://study.com/academy/lesson/how-to-select-adapt-materials-to-meet-student- needs.html

Swart E, Pettipher R 2005. A Framework for Understanding Inclusion. In: E Landsberg, D. Kruger, N Nel. (Eds): Addressing Barriers to Learning: A South African Perspective. Pretoria: Van Schaik Publishers.

Syomwene, A. (2017). Change and management of change in curriculum. In Syomwene, A. Nyandusi, C. & Yungungu, A. (2017) (Eds). *Core Principles in curriculum.* Eldoret: Utafiti Foundation.

The Learning Team Chapter 3: *Meeting Children's Diverse Learning Needs* page 29 Retrieved on 12th may, 2013 from *Education.alberta.ca/../learning.pdf.* 5/12/2013, 11:58, pm

Too,K.J.(1996)*A survey of the availability and use of media resources in Mathematics instruction, the case of secondary schools in Nandi District, Kenya. (*Unpublished M.Phil Thesis). Moi University

Too, S.K(2011) *Preparedness of teacher training colleges to integrate special needs education; A case study of Mosoriot teachers college*. (Unpublished Thesis). Moi University

Tuimur, H.N. (2011) *An investigation into the teaching of the topic conflict and conflict resolution in Social Studies: A case of selected primary schools in Kosirai Division, Nandi North District.* (Unpublished M.Phil. Thesis), Moi University

UNESCO (2002). Inclusive Education in Southern Africa. Responding to Diversity in Education, UNESCO Harare.

UNESCO (2000) The Dakar Framework for Action. Paris, Graphoprint.

UNESCO (1990) *World Declaration on Education for All*. Paris, UNESCO.

UNESCO (1994).*The Salamanca statement and Framework for Action on Special Need Education.* Paris: UNESCO.

UNESCO (1984). *The Educational Administrator and Instructional Materials.* Switzerland.

UN (1994). *Standard rules on equalization of opportunities for persons with disabilities.* Resolution adopted by the General Assembly.(Report of the Third Committee (A/48/627)1,UN.

Wandt, P, R. (1975). *Audio-Visual Instruction*. U.S.A.

Wanjala,J.(2005). *Perceptions of teachers and students on the use of small group method in mathematics instruction; A cases of secondary schools in Uasin Gishu District. (*Unpublished. M.Phil. Thesis,) Moi University. Eldoret, Kenya.

Whitney, R. (2014).*Universal Design for Learning in Action*: Maryland United States Brookes publishers.

Wiersma, W. Jurs, S.G (2005) *Research Methods in Education. An Introduction.* Boston: Pearson.

Willings, C. (2015). *Unique visual needs*. Retrieved frteachingvisuallyimpaired.com on 20th July 2018

Willings, C. (2017). *Labeling system*. Retrieved on the 21st July 2018, from;

teachingvisuallyimpaired.com

Wistrom, E. (2012). *Adaptations in the Classroom*. Edited by: Elizabeth Stannard
Gromisch  Retrieved on 26th July 2018 from www.brighthubeducation.com

Woodbury, R. (2015). *The Effects of a Training Session on Teacher Knowledge,
Perceptions and Implementation of Assistive Technology in Secondary Schools.*
All Graduate Plan   and other Reports. 540.
https://digitalcommons.usu.edu/gradreports/540

Zhao, Y., & Frank, K. (2003). *Factors affecting technology uses in schools: An
ecological perspective. American Educational Research Journal,* 40(4), 807-840.

Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. (2002). *Conditions for classroom technology
innovations. Teachers College Record, 104*(3), 482-515.

Zimbardo, E. M. (1977). *Influencing Attitudes and Changing Behavior,* Second edition,
An  introduction to methods, theory and application of social control and personal
power. London: Wesley Publishing Company.

Zindi, F. (2004) Education for All Towards Inclusive Education Policy Development in
Zimbabwe, Zimbabwe Journal of Educational

**APPENDICES**

**APPENDIX A: RESEARCH QUESTIONNAIRE FOR TUTORS**

I am a post graduate student in the School of Education, Moi University, carrying out a research study whose purpose is to assess integration of adaptive technology for visually impaired (VI) student teachers in instruction primary teacher training colleges (TTC) in Kenya. You are among those who have been selected to participate in the study. I kindly request you to respond to all the questions. All the information you provide will be used only for the purpose of this study and will be treated as confidential.

**Part 1: Background information**

Please indicate with a check (√) as applicable in the box provided.

1. What is your gender?        Female ( )        Male ( )

2. What is your highest academic qualification?

   Doctorate        ( )

   Masters        ( )

   Bachelors        ( )

   Diploma        ( )

   Other            ( )   please specify……………………………………………..

3. For how many years have you been in the teaching profession?

   Less than 5 years  ( )        6-10years    ( )

   11-15 years        ( )        More than 15 years  ( )

4. For how many years have you taught in Primary Teacher Training College?

   Less than 5 years  ( )        6-10years    ( )

   11-15 years        ( )        More than 15 years  ( )

5. How many years have you taught visually impaired student teachers?

   Less than 5 years  ( )        6-10years    ( )

   11-15 years        ( )        More than 15 years  ( )

6. Which subject do you teach?.......................................................................................

7. Which cohort of students are you currently teaching?

   1st year students                       ( )

   2nd year students                    ( )

   Both 1styear and 2nd year students   ( )

**Part 11: Availability and use of adaptive technology devices for VI student teachers for integration in Primary TTC.**

8. Below are some adaptive technology devices a tutor and VI student teachers may use during instruction. Indicate with a tick (√) whether the adaptive technology devices listed below are available and in use in your college.

| | Adaptive technology Devices | Available And in use | Not available | Available And not in use |
|---|---|---|---|---|
| i. | Tactile Diagrams | | | |
| ii. | Tactile Maps | | | |
| iii. | Tactile Globe | | | |
| iv. | Braille machines | | | |
| v. | Braille clock | | | |
| vi. | Large print texts | | | |
| vii. | Brailled textbooks | | | |
| viii. | Screen readers | | | |
| ix. | Tape recorded text | | | |
| x. | Real objects | | | |
| xi. | Talking tablets | | | |
| xii. | Highlighters | | | |
| xiii. | Magnifiers | | | |
| xiv. | Telescopes | | | |
| xv. | Slate and stylus | | | |
| xvi. | Closed-Circuit Television Magnification (CCTV) | | | |

| xvii. | Braille Note takers | | | |
|-------|---------------------|--|--|--|
| xviii. | Computer Screen Magnification | | | |
| xix. | Descriptive Video Services | | | |
| xx. | Optical Character Recognition | | | |

**Part 111: Tutor training on the integration of adaptive technology for VI student teachers in Primary TTCs.**

9. Do you have any training on Special Needs Education?     Yes   ( )  No ( )

10. Please state how you acquired your training in Special Needs Education, if any.

i) It was part of the university course                                ( )

ii) It was provided by the TTC                                ( )

iii) It was acquired privately                                ( )

iv)  It was provided by the Kenya Institute of Curriculum Development  ( )

v) Not applicable                                ( )

11. How do you rate your proficiency in English Braille?

Excellent ( )  Very good ( )   Good ( )   Fair ( )    Poor ( )

12. How often have you had training on preparation of tactile maps and diagrams?

Always ( )     Often ( )     Sometimes ( )     Rarely ( )          Never ( )

13. The following items relate to your expertise in the integration of adaptive technology for VI student teachers during instruction. Please rate yourself in terms of your current ability to use the following Adaptive Technology Devices (ATD) in class by ticking ($\sqrt{}$) the appropriate level of your expertise. The alternatives are: Poor (P), Fair (F), Good (G), Very Good, and Excellent (E)

| ATD | P | F | G | VG | E |
|-----|---|---|---|----|----|
| Tactile Diagrams | | | | | |
| Tactile Maps | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Tactile Globe | | | | | |
| Screen  readers | | | | | |
| Braille clock | | | | | |
| Tape recorded text | | | | | |
| Brailled textbooks | | | | | |
| Real objects | | | | | |
| Talking tablets | | | | | |
| Closed-Circuit Television Magnification (CCTV) | | | | | |
| Braille Note takers | | | | | |
| Computer Screen Magnification | | | | | |
| Descriptive Video Services | | | | | |
| Optical Character Recognition | | | | | |

**Part IV: Tutors' attitudes towards integration of adaptive technology for VI student teachers in Primary TTCs.**

The following statements express a feeling or opinion about the integration of adaptive technology for VI student teachers in Primary TTCs. Indicate with a tick (√) the alternative that best expresses the extent of your agreement on each statement. The alternatives are: Strongly Agree (SA), Agree (A), Undecided (UN), Disagree (D), and Strongly Disagree (SD).

| Statement | SA | A | UN | D | SD |
|---|---|---|---|---|---|
| 14.I feel that adaptive technology is valuable when teaching VI student teachers | | | | | |
| 15. I find adaptive technology easy to integrate in instruction of VI student teachers. | | | | | |
| 16.I feel that adaptive technology enhances VI student teachers' understanding of the subject content | | | | | |
| 17.I find adaptive technology a motivator of VI student teachers in learning the subject matter | | | | | |
| 18.I recommend that tutors should be trained on integration of adaptive technology for VI student teachers | | | | | |
| 19.I find teaching VI student teachers using ATD too demanding | | | | | |
| 20.I feel uncomfortable teaching VI student teachers using ATD | | | | | |
| 21.I am confident using ATD when teaching VI student teachers | | | | | |
| 22.I think that special education teachers are better placed to use ATD | | | | | |
| 23.I recommend that teaching VI student teachers using ATD should be optional | | | | | |

**Part V: College administration's support in the integration of adaptive technology for VI student teachers in Primary TTC.**

The following statements express a feeling or opinion about College administration's support in the integration of adaptive technology for VI student teachers in Primary TTC. Indicate with a tick (√) the alternative that best expresses the extent of your agreement on each statement. The alternatives are: Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D), and Strongly Disagree (SD).

| Statement | SA | A | UD | D | SD |
|---|---|---|---|---|---|
| 24. The college administration provides adequate ATD for VI student teachers | | | | | |
| 25.The college administration provides workshops and training for tutors on integration of adaptive technology | | | | | |
| 26.The college administration offers technical support and maintenance of adaptive technology devices | | | | | |
| 27.The college administration provides a braillist to assist tutors on ATD use | | | | | |
| 28.The college administration recognizes that integration of adaptive technology is important for VI student teachers | | | | | |
| 29.The college administration does not motivate tutors to use Adaptive technology | | | | | |
| 30.The college administration is not keen on the use of adaptive technology in instruction | | | | | |

**APPENDIX B: FOCUS GROUP INTERVIEW SCHEDULE FOR VISUALLY IMPAIRED STUDENT TEACHERS**

I am a post graduate student in the School of Education, Moi University, carrying out a research study whose purpose is to assess integration of adaptive technology for visually impaired (VI) student teachers in instruction primary teacher training colleges (TTC) in Kenya. You are among those who have been selected to participate in the study. I kindly request you to respond to all the questions. All the information you provide will be used only for the purpose of this study and will be treated as confidential.

**Part 1: Background information**

1. Sex

How many females?

How many males?

2. Extent of visual impairment

How many low vision student teachers?............................

How many totally blind student teachers?.........................

**Part 11: Availability and use of adaptive technology devices for VI student teachers for integration in Primary TTC.**

3. What kinds of adaptive technology devices are available and in use in instruction in primary TTC?

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……………………………………………………………………………………………

……………………………………………………………………………………………

……………………………………………………………………………………………

4. How do you rate your proficiency in English Braille?

……………………………………………………………………………………………

……………………………………………………………………………………………

5. Do you have any training on use of tactile maps and diagrams?

……………………………………………………………………………………………

6. How did you acquire your training on use of tactile maps and diagrams?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

**Part III: VI student teachers' perceptions on the integration of adaptive technology in instruction in Primary TTC.**

7. Why is adaptive technology valuable when teaching VI student teachers?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

8. In your own opinion do the tutors effectively use the adaptive technology devices when teaching?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

9. In what ways do the adaptive technology devices enhance your understanding of subject content?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

10. In what ways does adaptive technology motivate you in learning the subject content?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

11. In your opinion, should tutors use adaptive technology when teaching VI student teachers?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

Why?

…………………………………………………………………………………………………

………………………………………………………………………………………………

12. How do you find the lessons in which tutors do not use adaptive technology devices?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

**Part IV: College administration's support in the integration of adaptive technology for VI student training in Primary TTC.**

13. What challenges do you face with regard to the use of adaptive technology devices?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

14. What do you think the college administration can do to improve on integration of adaptive technology?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

# APPENDIX C: INTERVIEW SCHEDULE FOR DEANS OF CURRICULUM AND HEADS OF DEPARTMENTS.

I am a post graduate student in the School of Education, Moi University, carrying out a research study whose purpose is to assess integration of adaptive technology for visually impaired (VI) student teachers in instruction primary teacher training colleges (TTC) in Kenya. You are among those who have been selected to participate in the study. I kindly request you to respond to all the questions. All the information you provide will be used only for the purpose of this study and will be treated as confidential.

**Part 1: Background Information.**

Please indicate with a check (√) as applicable in the box provided.

1. Sex        Female ( )        Male ( )

2. What is your highest academic qualification?

   Doctorate        ( )

   Masters        ( )

   Bachelors        ( )

   Diploma        ( )

   Other        ( )   please specify…………………………………………………..

3. For how many years have you been in the teaching profession?

   Less than 5 years   ( )        6-10years    ( )

   11-15 years        ( )        More than 15 years ( )

4. For how many years have you taught in Primary Teacher Training College?

   Less than 5 years   ( )        6-10years    ( )

   11-15 years        ( )        More than 15yrs   ( )

5. How many years have you taught visually impaired student teachers?

   Less than 5 years   (  )        6-10years    (  )

   11-15 years          (  )       More than 15 years   (  )

6. Which subject do you teach?.......................................................................................

7. Which cohort of students are you currently teaching?

   1st year students                      (  )

    2nd year students                     (  )

   Both 1styear and 2nd year students    (  )

**Part II: Availability and use of adaptive technology devices for VI student teachers for integration in Primary TTC**

8) Which adaptive technology devices are available and used in instruction of visually impaired student teachers?

1………………………………………………………………………………………
2………………………………………………………………………………………
3………………………………………………………………………………………
4………………………………………………………………………………………
5………………………………………………………………………………………

**Part III. Tutor training on the integration of adaptive technology for VI student teachers in Primary TTC**

9). How many tutors are in your department/institution?

………………………………………………………………………………………

10).How many tutors in your department have training on Special Needs Education?

……………………………………………………………………………………………………

11). Are the tutors proficient in English Braille?

……………………………………………………………………………………………………

12). How many tutors have had any training on preparation of tactile maps and diagrams?

……………………………………………………………………………………………………

13). If there are any in the above question, please state how they acquired their training.

……………………………………………………………………………………………………

……………………………………………………………………………………………………

14) What is the level of expertise among the tutors in the integration of adaptive technology for VI student teachers during instruction?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

15) In your view, why is adaptive technology valuable when teaching VI student teachers?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………

**Part IV: College administration's support in the integration of adaptive technology for VI Student teachers in Primary TTC**

16). Does the college administration provide adequate adaptive technology devices for VI student teachers?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

17).How often does the college administration provide workshops and training on integration of adaptive technology?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

18). How does the college administration offer technical support and maintenance of adaptive technology devices?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

19). Does the college administration provide a braillist to assist tutors and VI student teachers on integration of adaptive technology?

…………………………………………………………………………………………………

20).Mention any challenges facing tutors in integration of adaptive technology in their instruction?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

21).In your opinion, what recommendations would you make to the college administration in order to improve integration of adaptive technology for VI student teachers in instruction?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

…………………………………………………………………………………………………

**APPENDIX D: OBSERVATION CHECKLIST FOR AVAILABLE ADAPTIVE TECHNOLOGY DEVICES**

Below are some adaptive technology devices for teaching visually impaired student teachers. Please tick (√) the adaptive technology device according to its availability in the primary teachers training college.

    i.    Tactile Diagrams ☐

    ii.    Tactile Maps ☐

    iii.    Tactile Globe ☐

    iv.    Braille machines ☐

    v.    Braille clock ☐

    vi.    Large print texts ☐

    vii.    Brailled textbooks ☐

    viii.    Screen readers ☐

    ix.    Tape recorded text ☐

    x.    Real objects ☐

    xi.    Talking tablets ☐

    xii.    Highlighters ☐

    xiii.    Magnifiers ☐

    xiv.    Telescopes ☐

    xv.    Slate and stylus ☐

    xvi.    Closed-Circuit Television Magnification (CCTV) ☐

    xvii.    Braille Note takers ☐

    xviii.    Computer Screen Magnification ☐

    xix.    Descriptive Video Services (DVS) ☐

    xx.    Optical Character Recognition (OCR) ☐

**Others**

1_____

2_____

3_____

4_____

## APPENDIX E: LETTER REQUESTING FOR PARTICIPATION OF RESPONDENTS

Moi University,

P.O. Box 3900,

**<u>Eldoret</u>**

Dear Sir/Madam,

I am a Post Graduate student in the School of Education, Moi University, carrying out a research study whose purpose is to assess the integration of adaptive technology for visually impaired student teachers in instruction in primary teacher training colleges in Kenya. Your college is among those selected for the purpose of supplying information useful this study. Your cooperation and assistance in doing so will be highly appreciated

All the information obtained from your institution will be used only for the purpose of this study and will be treated as confidential. The results of this study will be made available through publications.

Thank you.

Tuimur, Hilda Ngetich.

**APPENDIX F: MAP OF KENYA**



Source;Wordtravels at wordtravels.com retrieved on 12th may 2013
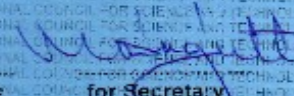
# APPENDIX G :RESEARCH PERMIT