European Journal of Special Education Research
ISSN: 2501 - 2428
ISSN-L: 2501 - 2428
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejse.v12i1.6457 Volume 12 | Issue 1 | 2026

IDENTIFYING THE AVAILABILITY OF INFORMATION COMMUNICATION TECHNOLOGY IN THE SPECIAL PRIMARY SCHOOLS FOR LEARNERS WITH VISUAL IMPAIRMENT IN KENYA

Keitany Julia Jelagat[i]
PhD Student,
School of Education,
Department of Early Childhood and Special Needs Education,
Kenyatta University,
Nairobi, Kenya

Abstract:
Information Communication and Technology has become the most suitable tool for learners with special needs, for it meets their different learning demands. Access to this tool by these learners is hence vital. This study aimed to identify the availability of information and communication technology in the special primary schools for learners with visual impairment in Kenya. The study was guided by Bruner's constructivist theory and was also supported by the social model of disability and the philosophy of universal design for learning. The study adopted a descriptive survey design and used both qualitative and quantitative methods of data collection. It targeted the seven special primary schools for the visually challenged in the country. The purposive sampling method was used to select the schools, head teachers, teachers and Ministry of Education officials. The stratified random sampling method was used to sample the learners. The sample size consisted of 3 MoE officials, 3 headteachers, 3 computer teachers, 18 class teachers and 168 learners with visual challenges. The students were selected randomly. Data collection instruments included questionnaires for the teachers and for the learners, a classroom observation schedule, and interview schedules for head teachers and officials from the Ministry of Education. Inventory document analysis was used to collect the data. Validity and reliability of the instruments were tested through piloting in one school, which was not included in the main study. The questionnaires were tested and accepted at r=0.785. Data was analyzed through descriptive statistics that included frequencies, percentages, means, ratios and inferential statistics. The Statistical Package for Social Sciences (SPSS) was used to analyze the data. The results showed that the schools had a variety of modern ICT resources, which could be helpful in accessing quality education for the learners. For instance, iPods and iPads, these devices could provide all the functionality, including WiFi, MN chat, and document processing. There was also Braille embosser technology, which enhanced the production of Braille in terms

[i] Correspondence email : jjkeitany@gmail.com

of the number of copies. The study concluded that the special primary schools have a variety of modern ICT resources, which could be helpful in accessing quality education for the learners, but the resources do not adequately meet the demands of the learners because they are inadequate. The ICT resources were accessed by a small number of learners with VI. The study recommended that special schools for learners with VI should be equipped with relevant, adequate and functioning ICT resources and other assistive technologies to enable the learners with visual impairments to benefit from the growing technology-based knowledge.

Keywords: availability of ICT resources, Information Communication Technology, learners with visual impairment, special primary schools

1. Introduction

Globally, special access to high-quality education is required for kids with visual impairments (Mugo, 2013). Despite the revolution in social and legislative policies regarding the provision of equal opportunities for high-quality education and good employment for these individuals, students with visual impairments still lag behind their sighted peers in school (United Nations Conventions on the Rights of Persons with Disabilities; UNCRPD, 2018). Research from throughout the world has shown that one of the greatest approaches to solve the problem of these students' lack of access to high-quality education is to incorporate Information, Communication, and Technology (ICT) into teaching.

According to UNESCO (2006), for example, ICT has emerged as the most effective tool for assisting individuals with varying learning needs in exercising their rights to education, work, social life, leisure, and democratic channels. Newhouse's (2002) study on the effects of ICT in Western Australia has also shown that ICT affects the quantity and quality of education worldwide. ICT literacy has, in essence, improved teaching and learning by offering genuine opportunities for tailored instruction through its dynamic, interactive, and engaging material.

The term "Information and Communications Technology" (ICT) is broad and encompasses all forms of communication, such as satellite systems, cellular phones, radio, television, networking, computer hardware, and software, as well as the many applications that are related to them, such as teleconferencing and distance learning (Dos Santos *et al.*, 2022). In order to accomplish learning objectives, using computers and technology-based tools offers exceptional chances for cooperation, development, and meaningful engagement with one another across a wide geographic distance (Orogbemi *et al.*, 2022). The incorporation of ICT into education has the potential to transform society's approach to learning and modify the characteristics and methods of the classroom (Montenegro-Rueda *et al.*, 2022). Convenience, adaptability, and intuition are now requirements in the ICT world. ICT lays the groundwork for a new learning culture by enabling learners to develop, change, and exchange ideas and information globally

(Arslantas & Gul, 2022). In order to improve analytical, creative, and problem-solving skills, it supports learner-centred, constructivist teaching methods (Akbar *et al.*, 2022).

ICT is now a reliable source of knowledge for transforming and reforming education. Contrarily, numerous studies demonstrate that effective ICT use can improve educational quality and link classroom instruction to real-world contexts (Kapote & Srikanth, 2021). ICT tends to open up more opportunities for visually impaired students to attend education anytime, anywhere. ICT helps visually impaired learners gain new knowledge by facilitating their access to, selection of, organization of, and interpretation of high-quality resources (Hood & Littlejohn, 2017). Additionally, ICT makes it possible for people who are blind or visually impaired to collaborate, explore ideas, develop concepts, learn, and share a variety of learning experiences (Tatut, 2022).

Those who are visually impaired are among those who are typically categorized as disabled. These individuals also include those who suffer from numerous disorders or impairments of the mind, body, or ears (Hall *et al.*, 2022). Those who are impaired are a small minority whose condition prevents them from competing favourably with those who are sighted in society. Therefore, their needs are not clearly stated (Campisi *et al.*, 2021). At all stages of human activity, it is now widely accepted that having information readily available is a requirement for enlightenment and meaningful progress (Jebril & Chen, 2021). In this contemporary society, which is largely governed and propelled by computer technology, any aspect of society that prevents a sector from benefiting from the advantages associated with access to knowledge is likely to suffer from marginalization and decadence (Kong & Loi, 2017).

East African countries also suffer from ineffective use of ICT for learners with disabilities. In Rwanda, the study by Sabomana (2017) revealed that the level of integration of ICT in teaching and learning science in lower public primary schools was low. It was found that the minimal use of ICT was influenced by inadequate ICT abilities among the majority of science teachers and inadequate resources in most primary schools. In Kenya, the government has put in place a national ICT policy and e-government strategy that provide guidelines for the transformation of the Kenyan population into a digital society. The government recognizes that an ICT-literate workforce is the foundation on which the nation becomes a knowledge-based economy. For this, the government made education a platform for equipping the nation with ICT skills to create dynamic and sustainable economic growth. To achieve this vision, every educational institute, teacher, learner, and respective community ought to have been equipped with appropriate ICT infrastructure, competencies and policies for usage and progress. The Ministry of Education Science and Technology (MOEST) calls for the transformation of teaching and learning with ICT to incorporate new pedagogies that are appropriate for the 21st century (Kenya Institute of Curriculum Development, 2017).

In Kenya, a study by Makanda (2015) on the use of ICT in teaching found that teachers had a positive attitude towards the use of ICT, but barriers such as inadequate skills to integrate the technology into their teaching were a problem. Moreover, lack of sight places certain restrictions on students with visual impairments' access to

information, which prevents them from reaching their full potential and wastes the brainpower that could have been used to boost the nation's economy (Barbareschi *et al.*, 2020). Researchers in Kenya have demonstrated that the performance of learners with visual impairments has lagged far behind that of their sighted peers at all levels of education (Munyi, 2017; Wanjau, 2016; Mugo, 2013; & Nzoka, 2011). Given the role that ICT plays in instruction, the performance of learners with visual challenges in Kenya should meet international standards. A pertinent question one would ask at this point is: are the schools for visually impaired learners in the country accessing and using ICT effectively in their teaching and learning?

1.2 Statement of the Problem

It is evident that ICT has a positive impact on the education sector, the world over and that many countries in the world have embraced the use of this technology in pedagogy. Kenya has made considerable efforts to make ICT accessible to all groups of learners, including those with visual impairments. To ensure quality education for all, the government has given support and put emphasis on the use of ICT in all schools at all levels, including special schools. Moreover, legislation such as the Kenya Constitution (2010), the Persons with Disabilities Act (2003), and the Special Needs Education Policy (2009) has resolved a number of important issues affecting the quality of education for learners with visual impairments. However, research has shown that these learners still lag behind their sighted peers in access to ICT. Researchers in Kenya have shown that, across all educational levels, the performance of learners with visual impairments has fallen well short of that of their sighted counterparts. Special schools for the visually impaired in Kenya have a legal obligation to provide learning support and substantive accommodations for the learners that afford them quality education and equal opportunities in their future lives. Nonetheless, the availability of ICT resources in the special primary schools for learners with visual impairment in Kenya is uncertain.

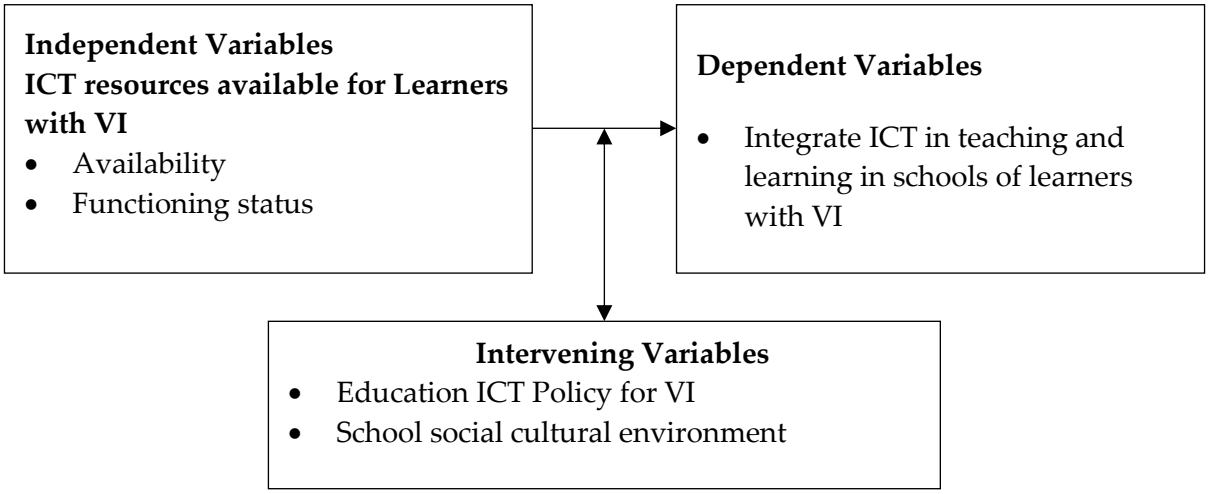
1.3 Purpose of the Study

The purpose of the study was to identify ICT resources available in the special primary schools for learners with visual impairment in Kenya.

1.4 Conceptual Framework

Figure 1 illustrates the interrelationship between the ICT resources available and the ICT integration in teaching and learning in schools for learners with VI.

Figure 1: Conceptual Framework



2. Literature Review

2.1 Theoretical Framework

This study was anchored in Bruner's constructivism theory, the social model of disability, and the universal design for learning theory. Bruner's constructivism theory (1990) postulates that the basis for innovation, creativity, or the process of generating new information is the learner's past experiences. The student makes use of the knowledge they already possess in order to learn new information from a teacher or facilitator. These encounters arise from the surroundings and from the learner's interactions with their classmates. The process of learning environmental creativity requires the learner to apply what they have learnt and experienced to generate fresh insights related to their area of emphasis. The teacher must ensure that all of the material he teaches is applicable to the real world or its surroundings. This could aid in the learners' acquisition of more knowledge that would allow them to resolve problems in their surroundings. The constructivism approach places a strong emphasis on the responsibility teachers have to effectively and actively involve students in the teaching and learning process. When teachers are given technology, for example, there are several elements that affect their choice of how and when to use it. Likewise, other education stakeholders may choose to supply technology to students or not, based on how highly they regard the learners.

The social model of disability can be traced back to the 1960s (Hunt, 1966), and in the 1970s, the Union of the Physically Handicapped Against Segregation (UPIAS, 1977) questioned the dominance of a section of the staff in the medical field and those in social work over people with disabilities. UPIAS resisted the status quo and strived for a change in the social order in society. The social model of disability is a comprehensive perspective originated by PWDs to define their place in society. It is endeavouring to bring together PWDs into one group by defining who they are and explaining disability as a political issue. The social model illuminates the areas in society where PWDs encounter discrimination and offers a chance for this group of individuals to act as a

united group to counter discriminatory practices (Campbell and Oliver, 1996). By exposing the areas of discrimination, the social model seeks to acquire for PWDs the same citizenship rights that people without disabilities possess. Also, teachers can demonstrate the disability as being abled differently by incorporating learning materials that enable them to perform better academically and depict disability positively (Ben-Moshe, 2006; Gallagher, 2006). The social model theory was relevant to this study because access and use of ICTs by learners with visual impairments depend on how school administrators and teachers in education take and support the learning through the provision of ICTs and quality instruction, respectively.

Universal design for learning theory provides an educational structure that is considered to make the best of learning opportunities for all learners to acquire knowledge, skills, and values in learning (Rose & Meyer, 2002; Rose & Meyer, 2006; Rose *et al.*, 2005). According to Scott *et al.* (2002), the theory of universal design was implemented as a form of instruction comprising practical design and the use of inclusive instructional strategies that benefit a wide range of learners, including those with disabilities. In the principles, multiple methods of expression where learners are given opportunities to interact with the learning material in a flexible manner are emphasized, and engagement, where learners are allowed to express their understanding of the learnt material in multiple and flexible ways, is paramount. Adopting this educational design was important in this study, for it helped to analyze how the teachers used ICTs with instructional methods to teach learners with visual impairments in the classroom.

2.2 Students' Factors Influencing Use of Information and Communication Technology

There is a growing awareness that people with disabilities have the right to expect the same service and access as every other member of society. However, disabled people must overcome additional obstacles before they can fully enjoy the information services, entertainment, and social interactions offered by ICTs. ICT is now employed as a tool to raise the quality of life through increased efficacy and efficiency. Various ICT tools help the disabled by enhancing their learning opportunities, capabilities, and potential in various spheres of life (Singhal *et al.,* 2019). ICT equips them with skills by enabling access to knowledge with appropriate digital media and software (Okonji & Ogwezzy, 2019). It accomplishes this by playing a crucial role in peer communication and fostering a collaborative and social learning environment. ICT supports children with disabilities in a variety of ways, including the reading, writing, hearing, and visual processes (Amponsah & Bekele, 2022).

The new digital ICT for visually impaired students combines a variety of technological tools and equipment, including hardware, software, and multimedia, to provide a variety of services (Kuma & Sanaman, 2013). The term "ICT in education" today refers to a wide variety of quickly developing technologies, including desktop, laptop, and handheld computers; digital cameras; local area networking; Bluetooth; the Internet; cloud computing; the World Wide Web; streaming; DVDs; word processors; spreadsheets; tutorials; simulations; email; digital libraries; computer-mediated

conferencing; video conferencing; virtual environments; simulators; emulators; and many other technologies (Kaur *et al.,* 2022). The following specialized ICT tools were thought to provide better services to visually impaired pupils, making them unique to the study (Omolara *et al.,* 2022).

One of the most well-known and potent screen reader tools accessible right now is Windows-Eyes. With this technology, you have complete control over what and how you hear. When Windows-Eyes is incorporated into Windows, it offers fast access to the operating system without the need to memorize a complex sequence of keystrokes (Liu *et al.,* 2022). Additionally, it has improved Braille support. The vision-impaired can unlock doors to an infinite amount of information with the help of Window-Eyes. Additionally, Access with Speech is a potent accessibility tool for people who are blind or visually impaired that reads text on a computer screen using synthesized speech. It offers a variety of helpful instructions that simplify using programmes, editing documents, and browsing the Web.

Another significant tool is text-to-speech (TTS) software, which helps young learners who have trouble reading regular print (Park *et al.,* 2017). Blindness, dyslexia, other visual impairments, learning difficulties, and other physical conditions that make it difficult to read are examples of common print disabilities. Students who are hard of hearing or deaf, as well as those with visual impairments, might benefit from a range of assistive listening technologies. Children who do not require hearing aids or cochlear implants but still need hearing assistance can use assistive listening systems to extend the range and effectiveness of those devices (Schles & McCarthy, 2022).

For schools where all of the students' listening needs need to be met, sound-field systems are a good option (Farhan & Razmak, 2022). Children with various disabilities also benefit from these devices, according to ASHA. Additionally, students studying English as a second language might use sound-field systems. Students with movement issues, such as paralysis and deficiencies in fine motor skills, employ sip-and-puff devices. With the use of these solutions, a youngster can move a computer, smartphone, or other technical application by moving the device with his or her mouth (Dos Santos *et al.,* 2022). A type of assistive technology called proofreading software goes beyond the standard functions of a word processing program for proofreading, such as fixing terms that the visually impaired regularly misspell (Amponsah & Bekele, 2022). Other features in this area can assist pupils in honing their English language proficiency and improving their writing quality. Mathematical assistive technology is not simply for people who have dyscalculia. It can also benefit kids who struggle to complete math-related tasks due to limitations, including eyesight, problems with their fine motor skills, or other conditions (Shefketi, 2020).

Technology is a tool for promoting equality since it provides persons with disabilities with assistive, adaptive, and rehabilitative equipment through proper selection, location, and use of these tools, depending on their disability (Mutia, 2020). Blind and partially sighted people have made use of assistive technology to raise their social inclusion and increase their level of independence when it comes to access to

education. For instance, Zaid (2018) lists the Kurzweil Reading Machine, computer, video conferencing, internet, and World Wide Web as the top ICT facilities that help the visually impaired learn. Also crucial is the use of various AT tools for visually challenged pupils, including screen readers, Braille translation software, Braille writing instruments, closed-circuit television (CCTV), Braille embossers, and scanners (Nahar *et al.*, 2022).

Additionally, assistive technologies benefit people with visual impairments by making electronic resources and tests more accessible, improving the reliability of students' work, expanding employment options, and decreasing overdependence (Kisanga and Kisanga, 2020). Additionally, assistive technology helps people with vision impairments manage their academic and social obligations as well as direct their career paths. In the field of education, AT provides instructors with cutting-edge resources to assist students with VI and other special needs in overcoming obstacles to their teaching and learning. Students with visual impairments and those with special education needs do need AT in this era of inclusion to interact with their teachers, peers, and educational resources (Tom *et al.*, 2018).

3. Methods

3.1 Study Locale

In consideration of this, the study was conducted in three counties: Kiambu County, Meru County, and Mombasa County. Although there are seven public special primary schools for learners with visual impairments spread across Kenya's counties, the researcher concentrated on these three counties due to the fact that they have the oldest special primary schools in terms of year of establishment. In addition, the schools have a large population, which yields rich data. Further, the study assumed that because these schools were established significantly earlier than the others, they are likely to have more ICT resources, which is therefore appropriate for the purpose of the study.

3.2 Study Design

This study adopted a descriptive survey research design. Descriptive survey research design describes the facts and characteristics of a given population or area of interest, factually and accurately. According to Mugenda and Mugenda (1999), a descriptive study is probably the best method for social scientists and educators who are interested in collecting original data for describing a population. The survey approach was used to assess the thoughts, feelings, and opinions of the respondents concerning the access and use of ICT in the instruction of learners with visual challenges (Mwanje, 2001). In order to collect in-depth and accurate data for the purpose of the study, this study also adopted both qualitative and quantitative research paradigms. Quantitative research relied exclusively on numerical or quantifiable data, while qualitative research relied on themes and words (Coffey, Holbrook, & Atkinson, 1996).

3.3 Study Population, Sampling Techniques and Sample Size

The study targeted seven special primary schools with learners with visual impairments. The schools are located in six counties, namely Kisumu, Siaya, West Pokot, Mombasa, Kiambu, and Meru. The study had a total target population of 1,845; these comprised 1,667 learners with VI, 161 teachers teaching learners with VI, 7 computer teachers, 7 head teachers, and 3 Ministry of Education officers in the six counties. The study employed the purposive sampling technique to sample three special primary schools. This was based on the fact that these three were the oldest special primary schools in terms of year of establishment. In addition, the schools had a large population with computer labs, thus relevant to the purpose of this study. The three schools were situated in three counties: Kiambu, Meru, and Mombasa counties. Further, the purposive sampling technique was used to sample the school headteachers of the three schools. The head teachers were sampled to participate in the study because they are the ones who are in charge of implementing government policy in the schools. Based on the recommendation by Mugenda and Mugenda (2019), the study sampled 195 respondents, which is 10% of the target population. The sample size consisted of three (3) head teachers, three (3) Ministry of Education officers, three (3) computer teachers, 18 teachers teaching learners with IV, and 168 learners with IV (Table 1).

Table 1: Sample Frame

Category of Respondents	Target population (N)	Sample (n)	Percentage (%)
Special schools	7	3	43
Learners with VI	1,667	168	10
Teachers	161	18	11
Computer teachers	7	3	43
Head teachers	7	3	43
Ministry of Education officers	7	3	43
Total	**1,849**	**195**	**10.5**

3.4 Research Instruments

Data was gathered using questionnaire forms, structured interviews, observation checklists and document analysis. The teacher's questionnaire obtained information about the use of ICT in the classroom and about how the teachers and the learners benefited from its use. Questionnaire for learners aimed at collecting information about the challenges the learners have in accessing ICT and the learners' opinions on how they benefited from the use of ICT in the teaching and learning process. The questionnaire was designed for those learners who used the system for their reading and writing. Semi-structured Interview schedules were administered to computer teachers, head teachers, and Ministry of Education officials. The interview schedule involved a set of predetermined questions. Classroom observation was carried out in three schools. A document analysis guide was utilized to collect data on the performance of learners with VI. In addition, the guide was utilized in obtaining data on the extent to which teachers used ICT in instruction.

3.5 Piloting

A pilot study was conducted in one of the special schools for learners with visual challenges in Kisumu County to determine the validity and reliability of the instruments. The sample for the pilot study was 10 participants, comprised of one head teacher, one officer from the Ministry of Education, one computer teacher, three teachers, and four learners. This exercise ensured that the instruments were in line with the research objectives and also determined the time duration that it would take to respond to the instruments. The pilot study also enabled the researcher to identify inconsistencies, discrepancies, and ambiguities that could have led to a misinterpretation of the research instruments.

3.6 Validity and Reliability of the Research Tools

In this study, content validity and construct validity were considered for measurement. The content and construct validity were ascertained. This was to establish whether the instruments measured what was intended. Expert opinion and judgement from the university supervisors were sought. Further, in this respect, piloting of the study instruments was done. Items in the questionnaire and interview protocol that were found to be inconsistent with the domain or content of interest were identified and modified to ensure clarity of information. The criterion, also known as predictive validity, refers to the use of a measure in assessing subjects' behaviour in specific situations (Mugenda & Mugenda, 2003). This was also measured in this research. To ensure criterion validity, the instruments were designed to achieve measurements that conformed to the theoretical expectations of the research. Experts' guidance from the supervisors who were conversant with the area of ICT and learners with visual impairment enabled this. Difficult questions were sorted and reframed using appropriate language, which was easily understood by the respondents with visual challenges.

To determine the reliability of the instruments for this study, the internal consistency technique was used. The instruments for this study during the piloting study were administered once. The Cronbach's alpha formula was then employed to compute the reliability of the instrument. The Cronbach's alpha reliability test is the most popular single-administration reliability test. It determines the agreement of answers to questions targeted at specific traits. Besides estimating the reliability coefficient, the Cronbach coefficient alpha has the added advantage of reducing the number of times the researcher is required to visit the field for data collection. In determining reliability, the higher the reliability coefficient, the more consistent participants are when filling out the questionnaire. Hence, in this study, the reliability coefficient of 0.72 was used to judge the reliability of the instruments. This implied that there was a higher degree of reliability in the data (Mugenda & Mugenda, 2003). Orodho (2009) opines that a reliability coefficient of 0.75 is considered high enough to judge the reliability of the instrument.

3.7 Data Collection Procedure

Data collection refers to gathering information to serve or prove some facts (Kombo & Tromp, 2006). The study considered the use of primary data, which was collected by administering interviews, questionnaires, and class observations to the respondents. The researcher adopted a drop-and-pick approach to administering the research instruments to the respondents. This approach was found appropriate since it would ensure a high rate of return for the instruments (Robinson, 2010). Upon obtaining authority from the university through the Graduate School and after obtaining research authorisation from the National Commission for Science, Technology, and Innovation (NACOSTI), I visited the sampled schools, explained the purpose of the study, asked for permission from the school heads, and created rapport with the respondents. She also arranged with the research subjects for the data collection. The researcher later administered the research instruments in the following order.

With the help of teachers, classroom observations were administered by sitting in classes six and seven in each of the three selected schools and observing lessons directly in each school. Each lesson lasted for 30 minutes. The observation guide to get the intended data guided the researcher. After and before observing each lesson, the researcher held discussions with the respective teachers about his or her expectations. The heads of departments, who included the head of mathematics, the head of sciences, the head of languages and the head of humanities, and four teachers from each of the schools sampled, were followed and observed at least three times. A total of 36 observations in the three schools were therefore carried out. Consequently, face-to-face interview schedules with the head teacher, the ministry of education representative, and the computer teacher were the next things to be done. The researcher met each one of them to book an appointment. Then, guided by the interview schedule, the researcher interviewed each one of them at each school on different days and recorded their responses.

Finally, the researcher distributed the questionnaires to the teachers herself and collected them three days later. This gave the respondents enough time to respond at their convenience, ensuring a high rate of return. Questionnaires in large print and in Braille were prepared in advance for the low-vision and totally blind learners, respectively. The learners' questionnaires were distributed to them with the assistance of the class teachers in the sampled schools. The researcher requested that the teachers assemble the students in a hall and explained to the students her expectations before filling out the questionnaires. The students were given one and a half hours to respond to the questionnaires, and then the researcher, assisted by their respective teachers, collected them as they left the hall. This ensured 100% collection of the questionnaires.

3.8 Data Preparation and Analysis

Quantitative data obtained through the research instruments were first organized based on the study variables. Organizing data is important since it makes the data more compact, easier to work with, and easier to understand (Weiss, 2004). The data was then

entered into SPSS version 22 and analyzed using descriptive statistics. Data on all the specific objectives were analyzed using frequencies, means, and percentages based on the objectives. The qualitative and quantitative data were used to complement each other in answering research questions. The findings of the study were presented using tables, graphs, pie charts, frequencies, ratios, and percentages in relation to research objectives and questions.

4. Results

4.1 General Characteristics of the Sample

The study collected demographic data from the respondents. This included age and experience, as well as academic and professional qualifications. From the data gathered, percentages and means were calculated for each category. The findings are presented in subsequent sections. The information gathered about the teachers included gender, age ranges, and educational and professional backgrounds. The results from the respondents are shown in Table 2.

Table 2: Demographic Information of the Teachers (N=18)

Demographic Information		**F**	%
Gender	Male	8	44.0
	Female	10	56.0
Ages (years)	20-30	1	6.0
	31-40	2	11.0
	41-50	7	39.0
	51-60	6	33.0
	Beyond 60	1	6.0
	Non commital	1	6.0
Experience in teaching VI	1-5 yrs	-	0.0
	6-10 yrs	3	17.0
	11-15 yrs	6	33.0
	16-20 yrs	4	22.0
	20 yrs & over	5	28.0
Highest academic qualification	KCSE/ KCE	11	61.0
	B. Ed	5	28.0
	Post graduate	1	6.0
	Noncommittal	1	6.0
Highest professional qualification	P1	3	17.0
	Diploma	8	44.0
	B.Ed	5	28.0
	Masters	1	6.0
	Noncommittal	1	6.0

According to Table 2, slightly less than half of the eighteen teachers sampled for this study were men, and slightly more than half were women. The age range of the teachers who taught classes six and seven was primarily between forty-one and fifty years old. A

little over 25% of the participants were aged 51 to 60. Less than 25% of the population was in the 31–40 age range. One teacher was younger than thirty years old, and another was older than sixty. The teachers' experiences in instructing students with visual impairments varied. Most of the instructors had taught for 11 to 15 years, over 25% had taught for over 20 years, and over 25% had taught for 16 to 20 years. Each teacher had been in the classroom for more than five years. The data also shows that slightly less than 25% of the teachers held a bachelor's degree in education, whereas the rest of them held diplomas. This demonstrates that these professors have strong academic credentials in addition to their teaching experience. It is true that individuals who completed their diplomas did so at the Kenya Institute of Special Education (KISE). This clearly shows that the teachers were trained and had substantial experience in teaching the learners who are visually challenged and, hence, could make a concrete contribution to this study. The gender and eyesight classifications of the learners are shown in Table 3.

Table 3: Demographic Information of the Learners

Category of Learners	**Male**	**Female**	**Total**
Blind	40 (24%)	73 (43%)	113 (67%)
Low Vision	34 (20 %)	21 (13 %)	55 (33%)
Total	**74 (44%)**	**94 (56%)**	**168 (100%)**

Table 3 demonstrates that the majority of the study's students with sight problems were female. The majority of the students were blind, and nearly half of the blind students in the sample were female. The proportion of low vision learners in the sample was somewhat higher than 50%, and males made up the majority of low vision learners. The gender issue had to be considered when analysing the demographic data for this research since it affects how the implementation strategies for the recommendations and suggestions are carried out.

4.2 ICT Resources Available in Special Primary Schools for the Visually Impaired

To achieve this, the researcher first obtained the school resource inventory and ticked off in the observation checklist the resources that were available in each of the schools sampled. The researcher then went further to establish the functioning status of the ICT resources and established the adequacy of these resources based on the user ratio. Table 4 presents the findings.

Table 4: ICT resources Available in the Schools for VI

Type of AT	**Number of items**		**Ratio of functional items to number of leaners**
	Functional	**Non functional**	
iPods and iPads	6	-	6:1667
Computers with voice output software	52	-	52:1667
Enhanced Vision Systems Cameras	2	-	2:1667
Talking calculators	32	-	32:1667
Embossers	3	-	3:1667
Scanners	3	-	3:1667

Braille sense	1	-	1:1667
CCTVs	6	-	6:1667
Smartphones	68	-	68:1667
Tablets	30		30:1667
JAWS (screen reader software)	6	-	6:1667
NVDA (screen reader software)	Free online	-	1667
Audio recorders	6		6:1667
Electronic books	36		36:1667
Compacts discs	8		8:1667

From Table 4, it is evident that the schools have a variety of modern ICT resources, which could be helpful in accessing quality education for the learners. The findings disagree with the findings reported by Kisanga and Kisanga (2021), who carried out research on the availability of assistive technology for students with visual impairments at higher education institutions in Tanzania. The study revealed that the biggest obstacles for students with visual impairments to using assistive technologies were a lack of ICT infrastructure and a lack of assistive technology tools. Further, the findings are central to the findings reported by Unal and Ozturk (2012) in their study on "Barriers to ICT Integration into Teachers' Practice in Turkey". The results of the study indicated that the main barriers to the use of ICT-based methods and equipment in teachers' instructional practices were a lack of ICT equipment in the classrooms and a lack of ICT-based teaching resources.

Based on the data presented in Table 4, the schools had adequate ICT resources based on the number of learners with VI. For instance, there were six (6) iPods and iPads. These gadgets have many built-in functions that help improve productivity and academic performance for these learners. Braille Sense, though it was only in one of the three schools that were sampled for the study, offers the ability to perform various tasks simultaneously. This device provides all the functionality of a laptop computer, including WiFi, MSN chat, document processing, and so on. Braille embosser technology (3) enhances the production of braille in terms of the production of many copies of braille documents. It was observed that the embossers were used to create tactile graphics and also to make copies of Braille texts in the schools (Johnson, 2004). In a relative study, Zaid (2018) supports this finding when he identified computers, video conferencing, the Internet, and the World Wide Web as the top ICT facilities that are helpful in learning for the visually impaired. Also crucial is the use of various AT tools for visually impaired pupils, including screen readers, Braille translation software, Braille writing instruments, closed-circuit television (CCTV), Braille embossers, and scanners.

Print-enlarging technology, including the enhanced vision system camera (2), enables magnification of very small print for easy reading. In addition, there were CCTV (6), which enabled the students to read printed text easily. The screen readers, which include Jaws (6) and NVDA, allow the challenged users to interact independently and efficiently with the computer. Some of this software, for example, Jaws and NVDA, has features that enable the enlargement of print text on the computer screen for easy

reading. The special scanner (1) is used to scan texts with small fonts and change the image to digital form, which can be enlarged and even converted into Braille (Mugo, 2013). According to Simui *et al.* (2017), assistive technologies can help visually impaired students all over the world learn by facilitating information access and retrieval, contacting friends, and knowledge sharing, just like sighted individuals do. ICT is essential for promoting the participation of the blind, especially in educational activities. In fact, ICTs can aid in exceptional ways to reduce and even eliminate the feeling of prejudice and open access to knowledge. ICT is typically utilized as a tool to enhance efficacy and efficiency in several socio-economic spheres, including education, hence raising the quality of life.

Further, the findings indicate whether the ICT available in the schools met the demands of the users. Looking at the ratios, one would say that only those technologies that were multi-user, for instance, audio recorders (6:1667), would efficiently serve the three schools. However, it was noted that one of the schools had only one while another had three. The NVDA software was free online, and hence, the schools could access it with ease. The scanners (3) and the embossers (3) would also be used to serve many users at the same time. Smartphones from the ratios appear to be many, but these belonged to individual teachers, and therefore, the learners would only access them when their teachers used them in the classroom. According to Kisanga and Kisanga (2020), assistive technologies benefit people with visual impairments by making electronic resources and tests more accessible, improving the reliability of students' work, expanding employment options, and decreasing overdependence. Additionally, assistive technology, including audio recorders, helps people with vision impairments manage their academic and social obligations as well as direct their career paths. In the field of education, scanners (3) and embossers provide instructors with cutting-edge resources to assist students with VI and other special needs in overcoming obstacles to their teaching and learning (Tom *et al.*, 2018).

From the ratios presented in Table 4, it was clear that the resources were not enough in the schools. The scarcity of ICT resources in schools is a common thing, especially in developing countries. ETD (2012) postulates that a very small number of learners with disabilities get access to adaptive technology in developing countries. This problem is not unique to developing countries. Studies in developed countries, including the USA, have also shown that these learners suffer from the same problem (ACAMPESD, 2011; Mugo, 2013). The cost, especially for special ICT, is intimidating. According to Hasselbring (2000), the special technology ranges between 700 and 2000 US dollars. This means that the ICT resources are not easily affordable, especially by students and even in schools in developing countries. The scarcity of ICT resources poses a serious challenge to access to quality education for learners living with visual impairments.

Mutisya *et al.* (2017) conducted their study to ascertain the impact of factors connected to the school on the integration of ICT in the management of public secondary schools in Kitui County, Kenya. According to the study's findings, there was a significant positive association between computer infrastructure and ICT integration in school

management ($r(50) = 0.842$, $p < 0.05$). Accessing the ICT resources in the schools of learners with VI is crucial because it will inform the researcher on how to approach other objectives. The availability of resources in schools means that teachers are expected to use them during the teaching and learning process. Integrating ICT in education is necessary for all individuals to develop and advance in the knowledge-driven world. Most of the current educational curriculum is oriented towards the use of eyesight; hence, individuals who are visually impaired experience challenges when acquiring education. The challenges experienced by the visually impaired can be resolved by the use of technologies, materials, devices, and equipment.

5. Conclusion

The study concludes that the special primary schools have a variety of modern ICT resources that could help learners access quality education. However, the resources do not adequately meet the learners' demands because they are inadequate. A small number of learners with VI accessed the ICT resources. This was especially so with those in the category of single users, for instance, laptops and iPods. Hence, the study concluded that there is a need for more resources in the schools of learners with VI in order to meet their demands.

Acknowledgement

Glory and honor be to God, for thus far He has been my Ebenezer. Amen. I wish to express my sincere gratitude to my two supervisors, Dr. Jessina Muthee and Professor Samson Ondigi, for their professional guidance and input that made the completion of this research possible. My thanks also go to Dr. Beatrice Bunyasi and Dr. Margaret Murugami for reading and helping me improve my thesis. I am highly indebted to all the respondents for their cooperation and participation in the study. My special thanks to Christine Omukuba for typing my work and being available at any time; I needed her assistance. Finally, I thank all the lecturers and support staff in the department of special needs education for their unwavering support. My husband, Obadiah Keitany, and our children, Kipchirchir, Jepchumba, and Jerop, for their support throughout the study.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author

Keitany Julia Jelagat is an experienced Special Needs Education Teacher. She taught Special Needs in Education learners for a period of more than 25 years in secondary schools and colleges. She has also lectured as a part-time lecturer in several Universities in Kenya.

References

ACE CENTRE Advisory Trust (1999). *Catchment: the use of telecommunication technology to provide remote support and training to young people with access difficulties.* ACE Center Advisory Trust.

Afshari, M., Baker, K. A. & Luan, W. S. (2009). Factors affecting teachers' use of Information and Technology. *International Journal of Instruction*. Vol. 2, N.º 11. Retrieved from https://eric.ed.gov/?id=ED524156

Akbar, A., Jabbar, A., Saleem, Q. U. A., & Ashiq, M. (2022). Access and Use of Digital Information Resources by Students with Vision Impairment: Challenges, Prospects and Expected Role of Libraries. *International Journal of Disability, Development and Education*, 1-19. https://doi.org/10.1080/1034912X.2022.2095356

Amponsah, S., & Bekele, T. A. (2022). Exploring strategies for including visually impaired students in online learning. *Education and Information Technologies*, 1-23. https://doi.org/10.1007/s10639-022-11145-x

Barker, P. (1999). Using intranets to support teaching and learning. *Innovations in Education and Training International, 36*(1), 3–10. Retrieved from https://doi.org/10.1080/1355800990360102

Bauer, J. & Keton, J. (2005). Technology Integration in the Schools*:* Why it isn't happening. *Journal of Technology & Teacher Education, 13,* 519-526. Retrieved from https://eric.ed.gov/?id=EJ723724

Campbell, J., & Oliver, M. (1996). *Disability Politics: Understanding our past, changing our future (1st ed.).* Routledge. https://doi.org/10.4324/9780203410639

Campisi, T., Ignaccolo, M., Inturri, G., Tesoriere, G., & Torrisi, V. (2021). Evaluation of walkability and mobility requirements of visually impaired people in urban spaces. *Research in Transportation Business & Management*, *40*. https://doi.org/10.1016/j.rtbm.2020.100592

Cohen, L., Manion, L. (1989). *Research methods in education*. (3rd Ed), London: Routledge. Retrieved from https://islmblogblog.wordpress.com/wp-content/uploads/2016/05/rme-edu-helpline-blogspot-com.pdf

Coudie, R., Monro, B., Seagraves, L., & Kenessons (2007). *The Impact of ICT in Schools – a landscape review*. UK. Retrieved from

https://oei.org.ar/ibertic/evaluacion/sites/default/files/biblioteca/33_impact_ict_in_schools.pdf

Creswell, J. W. (2005). *Educational Research Planning, Conducting and Evaluating Quantitative and Qualitative Research. (2nd Ed.).* Ohio. Prentice Hall. Retrieved from https://www.researchgate.net/publication/324451568_Educational_Research_Planning_Conducting_and_Evaluating_Quantitative_and_Qualitative_Research_6th_Edition

Detherridge, T. (1997). Bridging the communication Gap for Learners with Profound and Multiple learning difficulties. *British Journal of Special Education. 24(1),* 21-26. https://doi.org/10.1111/1467-8527.00006

Dos Santos, A. D. P., Ferrari, A. L. M., Medola, F. O., & Sandnes, F. E. (2022). Aesthetics and the perceived stigma of assistive technology for visual impairment. *Disability and Rehabilitation: Assistive Technology*, *17*(2), 152-158. https://doi.org/10.1080/17483107.2020.1768308

Earle, R. S. (2002). The integration of instructional technology into public education promises and challenges. *ET Magazines, 42*(1), 5-13. Retrieved from https://www.jstor.org/stable/44428716

Falloon, G. (2020). From digital literacy to digital competence: the teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449-2472. https://doi.org/10.1007/s11423-020-09767-4

Farhan, W., & Razmak, J. (2022). A comparative study of an assistive e-learning interface among students with and without visual and hearing impairments. *Disability and Rehabilitation: Assistive Technology*, *17*(4), 431-441. https://doi.org/10.1080/17483107.2020.1786733

Fehr, L., Langbein, W. E., & Skaar, S. B. (2000). Adequacy of power wheelchair control interfaces for persons with severe disabilities: A clinical survey. *Journal of rehabilitation research and development*, *37*(3), 353-360. Retrieved from https://pubmed.ncbi.nlm.nih.gov/10917267/

Fullan, M. (1982). *The new meaning of Educational change*. London: Cassel Educational Limited. Retrieved from https://michaelfullan.ca/books/new-meaning-educational-change/

Gallagher, S. (2006). *The narrative alternative to the theory of mind*. Conscious Emotion. 7. 10.1075/ceb.2.15gal.

Government of the Republic of Kenya. (2007). *Kenya Vision 2030 - The Popular Version*. Kenya Vision 2030 | Kenya Vision 2030. https://vision2030.go.ke/wp-content/uploads/2018/05/Vision-2030-Popular-Version.pdf

Hall, D. L., Allen-Collinson, J., & Jackman, P. C. (2022). 'The agenda is to have fun': exploring experiences of guided running in visually impaired and guide runners. *Qualitative Research in Sport, Exercise and Health*, 1-15. https://doi.org/10.1080/2159676X.2022.2092200

Hall, G., Mahony, J., Clapham, H., Heyworth, M., Lilley, R., Lawson, W., & Pellicano, E. (2022). 'A way to be me': Autobiographical reflections of autistic adults diagnosed

in mid-to-late adulthood. *Autism*, *26*(6), 1395-1408. https://doi.org/10.1177/13623613211050694

Hehir, T. (2003). *Beyond Inclusion. School Administrator.* Retrieved from https://www.researchgate.net/publication/234631437_Beyond_Inclusion

Hennessy, S., Ruthven, K., & Brindley, S. U. E. (2005). Teacher perspectives on integrating ICT into subject teaching: commitment, constraints, caution, and change. *Journal of Curriculum Studies*, *37*(2), 155-192. https://doi.org/10.1080/0022027032000276961

Hodas, S. (1993). *Technology refusal and the organizational culture of schools.* Education Policy Analysis. Retrieved from https://eric.ed.gov/?id=ED366328

Hood, N., & Littlejohn, A. (2017). Knowledge typologies for professional learning: educators'(re) generation of knowledge when learning open educational practice. *Educational Technology Research and Development*, *65*(6), 1583-1604. https://doi.org/10.1007/s11423-017-9536-z

Hunt, P. (1966). *Stigma: The Experience of Disability*. Retrieved from https://archive.org/details/stigmaexperience0000paul

Jebril, T., & Chen, Y. (2021). The architectural strategies of classrooms for intellectually disabled students in primary schools regarding space and environment. *Ain Shams Engineering Journal*, *12*(1), 821-835. https://doi.org/10.1016/j.asej.2020.09.005

Kapote, S., & Srikanth, P. (2021). Barriers and the role of assistive technology to access education for children with visually impaired during COVID-19 times. *Indian Journal of Clinical Medicine*, *11*(1-2), 55-56.

Kenya Law Reports. (2012). *Persons with disabilities act*. Welcome to the United Nations. https://www.un.org/development/desa/disabilities/wp-content/uploads/sites/15/2019/11/Kenya_Persons-with-Disability-Act.pdf

Khan, S. (2007). *The G3 ICT Initiative: Implementing the Resolution of the World Summit on the Information Society and the Millennium Goals.* In Gzict (Editor). The accessibility imperative. https://doi.org/10.1177/26339447221089124

Kisanga, D. H., & Kisanga, S. E. (2021). Access to assistive technology among students with visual impairment in higher education institutions in Tanzania: challenges and coping mechanisms. *University of Dar es Salaam Library Journal*, *15*(2), 137-151. Retrieved from https://www.ajol.info/index.php/udslj/article/view/210786

Kong, W. H., & Loi, K. I. (2017). The barriers to holiday-taking for visually impaired tourists and their families. *Journal of Hospitality and Tourism Management*, *32*, 99-107. https://doi.org/10.1016/j.jhtm.2017.06.001

Kothari, C. R. (2004). *Research methodology: methods and techniques, 2nd Edition*. New Delhi; New Age International (P) Ltd. Retrieved from https://www2.hcmuaf.edu.vn/data/quoctuan/Research%20Methodology%20-%20Methods%20and%20Techniques%202004.pdf

Kumar, S., & Sanaman, G. (2013). Preference and use of electronic information and resources by the blind/visually impaired in NCR libraries in India. *Journal of Information Science Theory and Practice*, *1*(2), 69-83. Retrieved from https://doi.org/10.1633/JISTaP.2013.1.2.5

Li, C., Omar, M., & Rasul, M. S. (2022). Research on the Effects of Integrating Information and Communication Technology (ICT) Into English Teaching in Technical and Vocational Colleges. *Journal of Positive School Psychology*, *6*(9), 1945-1954. Retrieved from https://journalppw.com/index.php/jpsp/article/view/12551

Lim, C. P. (2002). A theoretical framework for the study of ICT in schools: A proposal. *British Journal of Educational Technology*, *33*(4), pp. 411-421. https://doi.org/10.1111/1467-8535.00278

Lin, M. C., Wang, P.Y. & Lin, I-C. (2012). Pedagogy technology: a two-dimensional model for teachers' ICT integration, *British Journal of Education Technology, Vol. 15,* pp. 5-23. https://doi.org/10.1111/j.1467-8535.2010.01159.x

Liu, S., Shao, W., Li, T., Xu, W., & Song, L. (2022). Recent advances in biometrics-based user authentication for wearable devices: A contemporary survey. *Digital Signal Processing*, *125*. https://doi.org/10.1016/j.dsp.2021.103120

Makanda, J. L. (2015). Use of ICT in teaching physics: A case of secondary schools in Kimilili, Bungoma County, Kenya. http://ir-library.ku.ac.ke/handle/123456789/13431

Malik, R. S. (2018). Educational challenges in the 21st century and sustainable development. *Journal of Sustainable Development Education and Research*, *2*(1), 9-20. https://doi.org/10.17509/jsder.v2i1.12266

Matelong, E. C. (2019). *Influence of Socio-Economic Factors On Sustainable Fish Farming In Moiben Sub-County, Kenya* (Doctoral Dissertation, Kisii University). Retrieved from http://repository.kisiiuniversity.ac.ke:8080/xmlui/handle/123456789/8645

Miles, M. B., & Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. Thousand Oaks, CA: Sage Publications. Retrieved from https://vivauniversity.wordpress.com/wp-content/uploads/2013/11/milesandhuberman1994.pdf

Ministry of Education. (2005). *Draft policy for Information and Communication Technology in Education.* Republic of Trinidad and Tobago. Government Press. Retrieved from https://planipolis.iiep.unesco.org/index.php/en/2005/draft-policy-information-and-communications-technology-education-5032

Ministry of Education. (2006). *National Information and Communication Technology (ICT) Strategy for Education and Training. Nairobi: Government Press.* Retrieved from https://docs.edtechhub.org/lib/J4JBMDND?referrer=/lib

Montenegro, Rueda, M., Fernández, Batanero, J. M., & Fernández, Cerero, J. (2022). Impact of ICT on university students with visual impairment. *British Journal of Special Education 50(1)*. Retrieved from https://doi.org/10.1111/1467-8578.12433

Moore, D. & Taylor, J. (2000). Interactive Multimedia systems for Learners with Autism. *Journal of Education Media. 25(2), 169-175.* Retrieved from https://doi.org/10.1080/1358165000250302

Motzfeldt, H. M., & Næsborg-Andersen, A. (2018). Developing administrative law to handle the challenges of digital government in Denmark. *Electronic Journal of e-*

Government, *16*(2), pp. 136-146. Retrieved from https://academic-publishing.org/index.php/ejeg/article/view/658

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 [Thesis]. Retrieved from http://ir-library.ku.ac.ke/handle/123456789/9009

Munyi, C.M. (2017). Analysis of Teachers' Perceptions on Instruction of Braille Literacy in Primary Schools for Learners with Visual Impairment in Kenya. Unpublished PhD Thesis, Kenyatta University, Kenya. Retrieved from http://ir-ibrary.ku.ac.ke/handle/123456789/17844

Murrray, D. & Compell, N. (2000). *Barriers to Implementing Information Technology in some New Zealand schools*. Computers in New Zealand schools.

Mwanje, J.I (2001a). Issues in Social Science Research. Social Research Methodology Series. Module I. OSSREA. Addis Ababa, Ethiopia. Retrieved from https://books.google.ro/books/about/Issues_in_social_science_research.html?id=9zbHswEACAAJ&redir_esc=y

Newhouse, P. (2002*). Literature review: The impact of ICT on learning and teaching,* Perth, Western Australia: Department of Education.

Ngwu, O. G. (2014). Assessment of Availability and Utilization of ICT Resources in Teaching in FCE Eha-Amufu Enugu, Nigeria. Retrieved from https://www.semanticscholar.org/paper/Assessment-of-Availability-and-Utilization-of-ICT-Ngwu/3af81007891eb9df2c1257bb279e1f489d5c66e1

Nzioka, J. N. (2011). Factors Influencing the Selection and Utilization of Learning Resources by Tutors in Three Selected Primary Teachers' Colleges in Kenya. Unpublished PhD Thesis, Kenyatta University, Kenya. Retrieved from http://ir-library.ku.ac.ke/handle/123456789/3603

Orodho A. J. (2009). *Elements of Education and Social Science Research Methods,* Kanezja Publisher. Retrieved from https://www.researchgate.net/publication/310832267_ELEMENTS_OF_EDUCATION_AND_SOCIAL_SCIENCE_RESEARC

Orogbemi, O., Uzor, M., & Oduwale, A. (2022). Information and Communications Technology in Education for Persons with Special Needs (ICTEPSN). *Science*, *10*(1), 12-17. https://doi.org/10.11648/j.sjedu.20221001.12

Republic of Ghana. (2008). *Information and Communication Technology Policy*. Government press.

Robinson, V. (2010). From Instructional Leadership to Leadership Capabilities: Empirical Findings and Methodological Challenges. *Leadership and Policy in Schools,* 9, (1). 1-26. https://doi.org/10.1080/15700760903026748

Rogan, J. M. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education. 25*(10) 1171- 1204. https://doi.org/10.1080/09500690210145819

Rose, D. H., & Meyer, A. (2006). *A practical reader in Universal Design for Learning*. Cambridge, MA: Harvard Education Press. Retrieved from https://eric.ed.gov/?id=ED515447

Rose, D., & Meyer, A. (2002). *Teaching every student in the digital age*. Alexandria, VA: ASCD. https://doi.org/10.1007/s11423-007-9056-3

Rose, D. H., Meyer, A., & Hitchcock, C. (Eds.). (2005). *The universally designed classroom: Accessible curriculum and digital technologies*. Cambridge, MA: Harvard University Press. Retrieved from https://eric.ed.gov/?id=ED568861

Sabomana, A. (2017). *Determinants of Integration of Information and Communication Technology in teaching and learning of science in low public primary schools in Gasabo District, Rwanda.* Unpublished project. Kenyatta University.

Scott, S. (2013). iOS - Worthy of the hype as assistive technology for visual impairments? A phenomenological study of iOS device use by individuals with visual impairments. (Doctoral Dissertation), Tennessee State University, Nashville, Tennessee. Retrieved from https://digitalscholarship.tnstate.edu/dissertations/AAI3601339/

Shefketi, B. (2020). Technologies That Enhance the Education of Students with Learning Disabilities. *Knowledge-International Journal*, *38*(2), 385-389.

Stodden, R. A., Dowrick, P. W., Anderson, J., Heyer, K., & Acosta, J. (2005). Postsecondary education across the USA: Experiences of adults with disabilities. *Journal of Vocational Rehabilitation*, 22, 41- 47. https://doi.org/10.3233/JVR-2005-00272

Tezet, E. (2011). Factors that influence pre-service teachers' ICT usage in Education. *European Journal of Teachers Education. Vol. 34.* pp. 483-499. Retrieved from https://doi.org/10.1080/02619768.2011.587116

Theodorou, P., & Meliones, A. (2022). Gaining insight for the design, development, deployment and distribution of assistive navigation systems for blind and visually impaired people through a detailed user requirements elicitation. *Universal Access in the Information Society*, 1-27. https://doi.org/10.1007/s10209-022-00885-9

Tom, S. L., Mpekoa, N., & Swart, J. (2018, March). Factors that affect the provision of visually impaired learners in higher education. In the *2018 Conference on Information Communications Technology and Society (ICTAS)* (pp. 1-5). IEEE. Retrieved from https://ieeexplore.ieee.org/document/8368741

UNESCO IITE, (2006). *ICTs in education for people with special needs; specialize training course.* Retrieved from https://iite.unesco.org/pics/publications/en/files/3214644.pdf

UNESCO, (2009). *Policy guidelines on inclusion in education,* Paris, UNESCO. Retrieved from https://www.eenet.org.uk/resources/docs/177849e.pdf

UNHCRPD, (2006). United Nations Conventions on the rights of persons with disabilities. Retrieved from https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf

UNICEF, (2007). *Promoting the Rights of Children With Disabilities.* Innocenti Research Centre. Retrieved from https://www.un.org/esa/socdev/unyin/documents/children_disability_rights.pdf

UPIAS, (1977). Fundamental principles of disability. London: Union of the Physically Impaired Against Segregation.

Wanjau, A.W. (2016). Policy and Provision of Learning Supports and Accommodations for Students with Disabilities in Kenyan Public Universities. Unpublished PhD Thesis, Kenyatta University, Kenya. Retrieved from http://ir-library.ku.ac.ke/handle/123456789/17971

Young, M. C., Courtad, C. A., Douglas, K. H., & Chung, Y. C. (2019). The effects of text-to-speech on reading outcomes for secondary students with learning disabilities. *Journal of Special Education Technology*, *34*(2), 80-91. https://doi.org/10.1177/0162643418786047

Zaid, Y. A. (2018). Inclusive Education Policy as Platform of Library Services for Students with Visual Impairment in Nigerian Universities: Lessons from the United States of America. Retrieved from https://ir.unilag.edu.ng/items/0c4d35a0-836a-4e6b-9fa9-8cc8c570fcfd